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THE FOUNDRY

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Trade Outlook.

That the foundry trade continues in a very healthy condition is shown by the scarcity of standard brands of pig iron as well as by the urgency with which shipments are asked to be hurried forward. This applies to all branches of the trade, each of which seems to have all the work it can possibly turn out and some to spare. The capacity of existing plants is continually being enlarged and newcomers help to swell the total production of castings without in any way seeming to cause a glut in the market. Advances of molders' wages have taken place not only in the chief centers of the country but in nearly every hamlet which can boast of a foundry. Besides advancing the minimum wage rate foundrymen have been free in increasing the pay of first-class workmen in the effort to keep their shop forces intact. When all is counted up it is doubtful if these advances to individuals have not been greater than the horizontal advances which have been granted. The number of really first-class molders needed may be small when compared to the whole number of men engaged in "pounding sand," but their ability can not be transferred to others on short notice and more than one foundryman has found it to his interest to keep his scale of wages for good mechanics above that of his competitors.

The stove trade, which was affected by the steel strike to some extent, especially on designs requiring the use of sheet steel in their construction, is working at a high speed to meet demands upon it, and it is just possible that a small advance may be made by the manufacturers at the beginning of the year. From present appearances makers of stoves are inclined to regard the year as one of the best the trade has ever experienced.

No complaint is heard from the malleable and steel foundries, in fact with these it seems to be more a question of granting reasonable deliveries than to secure new orders. The agricultural implement manufacturers, judging from the way they are covering their wants in iron and steel, are expecting the present demand for their product to be maintained. The general jobbing foundry, the most sensitive thermometer of the trade, has but little to fear as long as equipment for mills and machine shops continues to be made, and finds a market at the present rate.

In prices Northern irons have been relatively lower than Southern brands. Consumers as a rule are carrying small stocks, and the furnaces have their books so well filled that they are not finding themselves under the necessity of encouraging orders to come forward. Needless to say some foundries encounter difficulty in procuring satisfactory mixtures, but as a rule they have only their own delay in covering their requirements to blame for such conditions.

The Foundry is Going Ahead.

The foundry is generally credited with being the most backward part of a manufacturing institution. It is charged with being unprogressive and possessing an all around thickheadedness in refusing to do everything by machinery. The fact of it is, however, that much, if not most, of the machinery which has been

designed with the object of relieving the foundryman of labor has proved itself incapable of performing the mission for which it was made. We doubt if there has been an appliance placed on the market, which has proved itself worthy of adoption by the foundries that has not met with fairly uniform success.

Hardly an issue of THE FOUNDRY goes to press without having among its contents the description of several new shop tools and appliances. A great many of these, it is true, can only be used to advantage in special instances, but all the same it shows that the inventive genius is no more lacking among foundrymen than any other class of manufacturers.

It should not be forgotten that the majority of people who invent something useful, make too great claims for its utility. We know, for instance, of several molding machines, designed to meet conditions in a certain branch of the trade, for which it was sought to obtain a universal introduction. That such attempts should meet with failure must have been apparent at the start to every practical man acquainted with the scope of the appliances in question.

Nor should it be forgotten that the foundry trade is to a certain extent limited. A fair estimate of the iron foundries in the United States at the present time would place their number at about forty-seven hundred. We know of a certain party who is manufacturing a very useful device who expects to dispose of these at the rate of twenty per day. At this rate he would cover the country in nine months and that he will be disappointed in his expectations is a foregone conclusion.

The present number of THE FOUNDRY is specially prolific in descriptions of new things for the foundry and calling the reader's at-

tention to these we leave it to himself to judge as to how far they can assist him in making better castings and more of them.

The Climax Core-Wire Straightener.

Every foundry using cores of any great dimensions will be interested in the machine shown herewith which has been designed to straighten core rods. Nearly every shop is blessed with a large accumulation of bent and twisted rods from which the coremakers select only such as are easily straightened out. The result is that requisitions are continually being made for new rods, while the stock of old ones keeps on growing larger.

With the Climax Core-rod Straightener the supply of core rods can always be kept in good order and no time need be wasted by the coremaker in handling a lot of material he cannot use. Our first illustration shows the side of the machine which receives the bent rods and the second gives a view of their appearance on the other side ready for use. It is evident that the coremaker will save considerable time, as knowing the length of rod he wants their size is at once apparent when straightened.

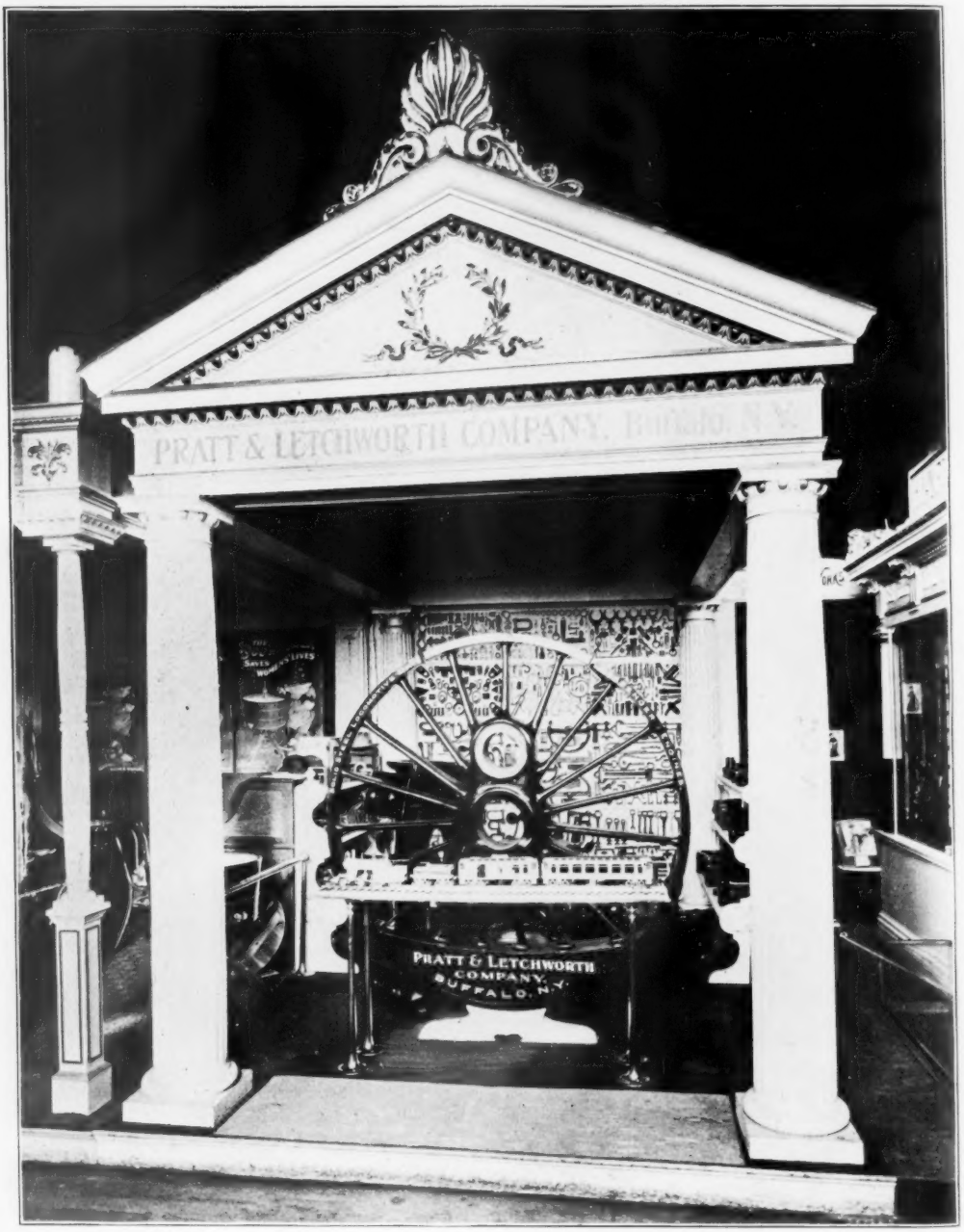
With hand work it is doubtful if very much is saved in straightening rods, but with the Climax Straightener the cost of putting old material into shape to be used again is so

small that a great gain is effected. This machine is designed by George de Laval of East Cambridge, Mass., and it will likely be placed on the market in a short time.

Ed O'Brien is now foreman of the Marion (Ind.) Gray Iron Foundry.

The Stowell Mfg. & Foundry Company.

The organization of the Stowell Mfg. & Foundry Company of South Milwaukee, Wis., dates back to 1896, in which year it succeeded to the business of the Moore Mfg. & Foundry Company. Since that time the works have

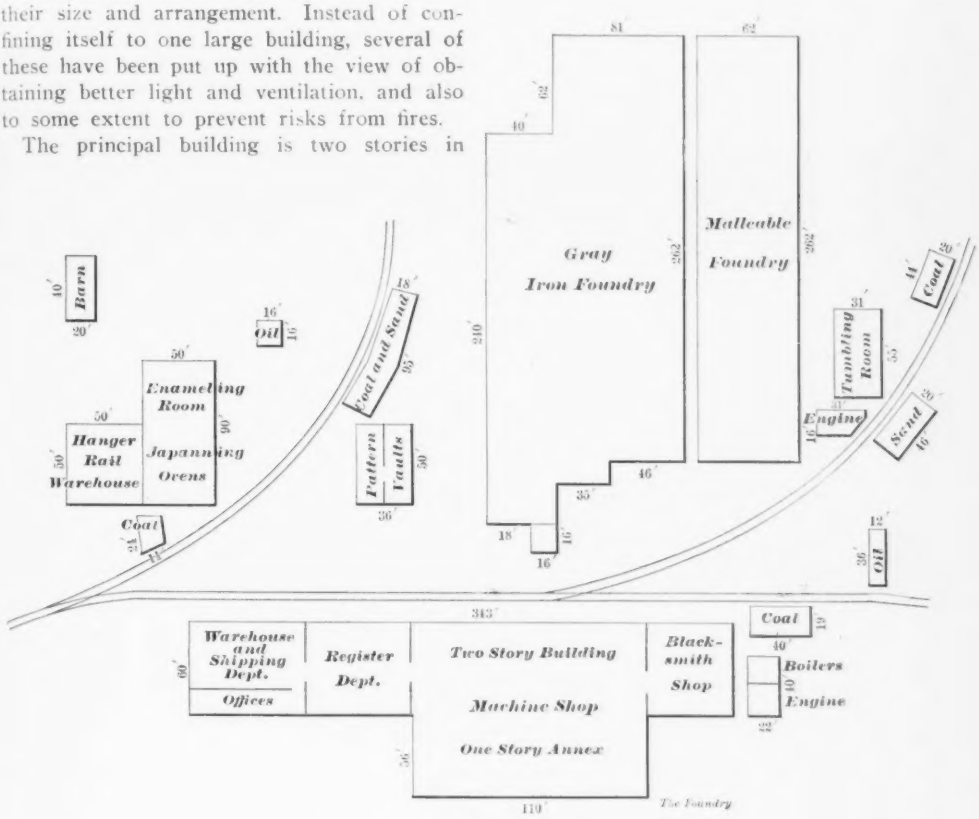


PAN-AMERICAN EXHIBIT OF THE PRATT & LETCHWORTH CO., BUFFALO, N. Y.

been more than doubled in capacity and many new specialties added to the product of the company.

The difficulty of obtaining malleable castings induced the company to erect its own plant, which also supplies a certain part of outside trade. The plan of the company's works shown herewith gives an idea as to their size and arrangement. Instead of confining itself to one large building, several of these have been put up with the view of obtaining better light and ventilation, and also to some extent to prevent risks from fires.

The principal building is two stories in



PLAN OF STOWELL MFG. & FOUNDRY CO.'S PLANT.

height and for the greater part is 60 feet wide. Its length is 343 feet. On the ground floor are the offices and shipping room, the department for assorting malleable castings and finishing registers, the machine shop and blacksmith shop. The second story is used partly as a pattern shop and as a stock room, the former being principally used for the manufacture of metal patterns, as but few wood patterns are used by this concern.

The gray iron foundry is located in an irregular building, 100 feet wide at its central part and 262 feet long. As nearly all the castings manufactured are of a light character there is but little floor molding done, bench work being the rule. Since many of the castings are made in great numbers the company has found it to its advantage to use molding machines, which have been built according to their own designs. Careful tests are made daily of the iron mixtures employed.

The malleable foundry is located in a building, 60 feet wide by 260 feet long, having a clear molding space without any obstructions whatever. The reverberatory furnace is used for melting. Crude oil is used as a fuel for operating the annealing ovens. Reports state that it is the firm's intention to double the size of the malleable department at an early date, besides making other additions.

The president of the company is John M. Stowell, one of the founders of the Filer & Stowell Company of Milwaukee, Wis. George P. Jones of Chicago is vice-president; Charles E. Sammond, treasurer and manager; Robert Moscrip, secretary, and Adolph Ricker, superintendent.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

Clean Castings.

The letter does not state the size of the castings, but they are more or less unsound. They are to be polished and copper plated and they show pits.

Answer. The iron must be fluid to make clean castings. An increase of silicon and melting heat are the only practical methods for increasing fluidity.

Gas and dirt will escape from fluid iron.

If your castings are not to be heated, a solder of nearly all tin can be melted into the holes and copper plating will cover the filling.

If the castings are to be heated the only way is to drill holes in the pits and drive in copper plugs.

To make the grain of a casting close and compact use scrap. Stove plate scrap will close the grain more than larger scrap.

Cast iron can be tinned successfully. The surface must be perfectly clean and you had better employ some person accustomed to such work to prepare the apparatus.

You can solder cast iron with an ordinary well tinned soldering copper and with ordinary solder. File the surface bright and wet the surface with muriatic acid in which has been dissolved all of the zinc that it will take.

Sweat the solder into the iron surface. The union is not as strong as on wrought iron. The two parts, after being tinned, may be riveted together with copper rivets, when the solder will sweat the surfaces and rivets together. Copper rivets may be driven into the cast iron surfaces before they are filed smooth and tinned, thus making a stronger joint.

GRADING IRON BY ANALYSIS.

The remarks of Mr. Colby on pages 58 and 59 of the October issue suggest a few words.

Chemists often endeavor to make founders think that iron which contains the desired percentages of silicon and sulphur will make as desirable castings, whether the pig iron has a close and uneven grain or a uniform open grain.

I do not think that it is safe at present to allow a furnaceman to deliver any close-grained iron that they choose, even if it has the desired silicon and sulphur, because a close uneven grain indicates that the furnace was not working well.

Mr. Colby says: "Nor did I intimate that a foundry iron made when the furnace was working badly, (and hence usually deficient in total carbon) would make as satisfactory a casting as an iron, of similar silicon and sulphur contents, made under normal furnace conditions."

This is my contention, and I say that the reason that the furnaceman is so anxious to have a founder specify the silicon and sulphur, and let the grain be ever so close and uneven, is for the purpose of allowing them to get

INTERIOR VIEW OF MALLEABLE FOUNDRY, STOWELL MFG. & FOUNDRY CO.

rid of the large quantities of iron that they make when the furnace is working badly.

Mr. Colby says: "The foundryman who specifies certain silicon and sulphur and an open-grained fracture has made a decided advance over the man who still purchases iron entirely by grade."

We are purchasing pig iron by exactly that method, but the furnace is very anxious to have us purchase *either* by silicon and sulphur, or by grain, but *not by both*.

Continuing the above question, "both would get more uniformly successful castings *at a less cost* by obtaining a full analysis of their good castings and then buying *entirely* on chemical specifications, the cheapest irons obtainable on the market, which, when mixed and melted, give the chemical composition desired."

In another paragraph Mr. Colby states "that total carbon, as well as other constituents, must be alike." "Under these conditions of entire similarity in chemical composition the close or open grained fracture of the two irons will have no influence on the physical qualities of the castings made therefrom." I know from experience that even this is not always the case.

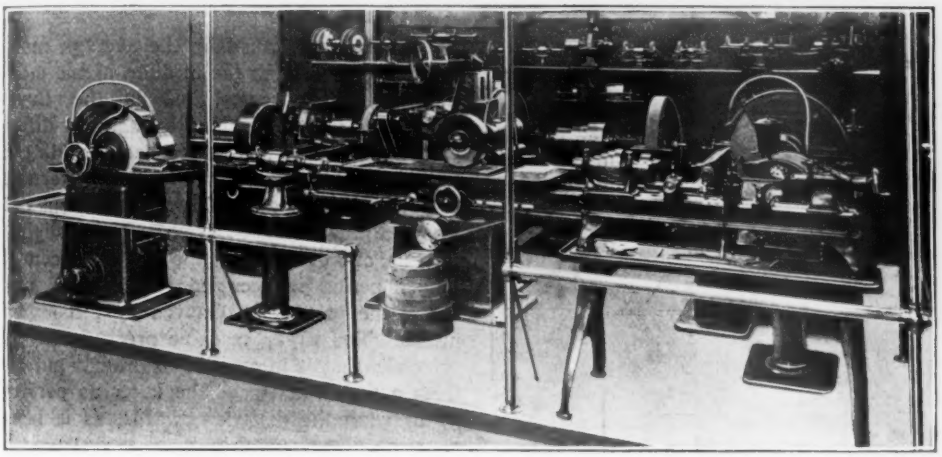
But is it not a fact that very few furnaces would be willing or able to furnish cheap irons with a full chemical analysis that would meet a specification?

This would be more difficult than to furnish pig iron with silicon and sulphur within specified limits and with a uniform open grain.

All this discussion relates to sand-cast pig iron, such as nearly all founders must use. If the furnaces will give us pigs cast in iron molds, with a 4″ x 4″ cross section, delivered in half pigs 24 inches long, each having a notch on the underside, so that we can break them without trouble, (and cast the brand on each section) with no sign of chill in the edges of the fracture, we will not object to a close grain. I am in favor of such machine-cast pigs.

A Pipe Molding Machine.

Shepherd and Leigh of Stockport, England, have secured a patent on their machine, illustrated herewith, which has for its purpose



PAN-AMERICAN EXHIBIT OF THE DIAMOND MACHINE CO., PROVIDENCE, R. I.

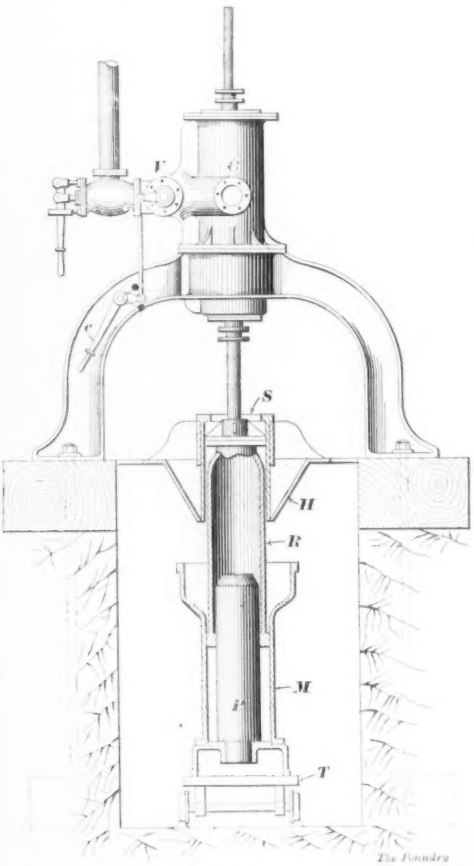
the object of molding water and gas pipes and the making of cores for the same by a more rapid method than is now in vogue. The inventors claim that six molds or cores for 24-inch pipe may be made with these machines in five minutes. In the machine shown, but one ramming head is provided, although in practice it is intended to place six rammers on each machine and in this way ram six molds simultaneously.

In the illustration C is a vertical cylinder. R is the rammer proper which is fastened to the piston rod S. H is a hopper through which the sand is supplied to the mold. P is the pattern and N the flask supported on the carriage T. Each hopper of sand is given three blows by the rammer and is calculated to fill a space about a foot high in the mold.

Not only is this machine intended for the making of molds, but also for the ramming of cores. In this case the flask is replaced by a core box and the pattern by a core barrel. The inventors say that with six of these rammers going at once and ramming up a foot

of pipe or core at a time, that it will not take long to complete a mold, which is probably true. With one set of flasks it is intended to make five sizes of pipes. It is also claimed that the same flask and patterns will do for making either socket, spigot, or flange pipe and that a saving will thereby be effected.

In making cores it is also intended to use



SHEPHERD AND LEIGH'S PIPE MOLDING MACHINE.

one set of core barrels for five different sizes of pipe. As the cores made by this method will remain in a vertical position from the time they are made until the mold is poured, it is claimed that they can be handled quicker and that no hay rope will have to be employed on the barrels. In short, instead of making loam cores, it is proposed to make what is properly called a dry sand core which will require less fuel and time in drying.

Bryan Vacuum Molding Machine.

The Bryan Vacuum Molding Machine Co. of Lockport, N. Y., are placing on the market a novel machine, calculated to help the molder to produce more perfect castings in shorter time. The manufacturers call this a molding machine, a name which in reality does not describe the scope of its work. A pattern-drawing machine would be a much better designation.

More than one-half of all the devices which have been built under the name of molding machines, are not molding machines at all. They are pattern-drawing machines pure and simple. The plain squeezer is much more a molding machine than some of its more expensive neighbors which only draw the pattern.

The duty performed by the average molding machine through the medium of the stripping plate is accomplished in the Bryan Vacuum Molding Machine by entirely different means. The objection to hand molding is that the molder cannot balance his pattern, in removing it from the mold, with sufficient delicacy to prevent the mold from being slightly torn up, and even where this does not occur, a longer period is occupied than is the case where the pattern is removed by mechanical means. The Bryan machine proceeds on the principle, that it is possible to draw a pattern from a mold, and leave the latter as perfect, by drawing the pattern upwards, as it is to

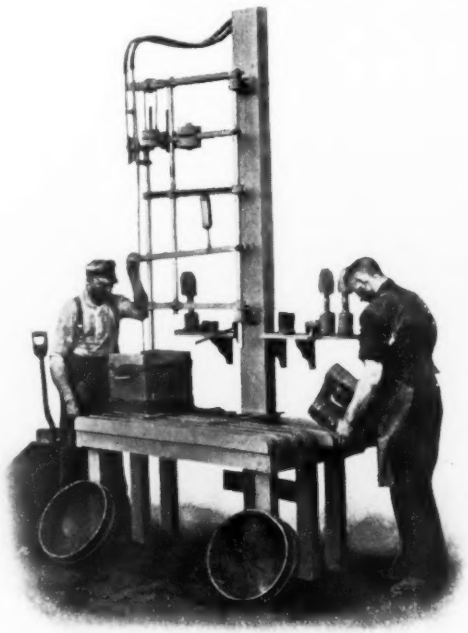


FIG. 1. BRYAN VACUUM MOLDING MACHINE.

accomplish the same by drawing the pattern downwards through a stripping plate.

For use with the Bryan machine it is but necessary that the pattern shall be mounted on matchplates, the latter in turn fitting an interchangeable set of flasks. As shown in the illustrations the machine is so placed as to serve two molders. The drawing of the pattern is accomplished by what is called a "sucker-head" placed on the matchplate, after the mold has been rammed up and turned over. By an arrangement of valves the air is exhausted from the sucker-head, which then adheres strongly to the pattern when counterweights lift the latter from the mold and cause its release when a certain height is reached. In Fig. 1 the operator at the left is pulling down on a handle which brings the sucker-head in contact with the matchplate. When this lever is released the counterweights

FIG. 2. BRYAN VACUUM MOLDING MACHINE.

cause the sucker-head and patterns to move upwards in a perfect vertical direction. An automatic rapper is provided, the use of which may be omitted, where not necessary and rapping with a mallet substituted.

In Fig. 2 the molder at the right has just drawn the pattern to the height at which it is automatically released. Fig. 3 is shown to give an idea of the appearance of the mold and

FIG. 3. BRYAN VACUUM MOLDING MACHINE.

pattern. The machine is suitable for use on any patterns which come within the range of bench work. Besides being capable of drawing patterns this machine may also be employed for lifting core boxes from complicated cores.

Heavy Inducements.

A mass meeting of the citizens of Stockport was held last Wednesday and the proposition of the Pool people was considered. The Pools are figuring on locating a foundry somewhere in that section and ask a bonus of $300. A committee was appointed to canvass the town and at last report good progress was being made toward raising the necessary funds. The foundry will bring three families to the town besides giving employment to several others and is a nice little industry. Should the proposition carry, a building 33x70, of brick, will be put up.—*Bonaparte (Ia.) Bee.*

Good Advice.

There is but one way to draw the temper of chilled cast iron, namely: break it in pieces and mix it with good Scotch pig or its equal, remelt and recast. This is the only practical method.—*Blacksmith and Wheelwright.*

RHODE ISLAND MALLEABLE IRON WORKS.

The Rhode Island Malleable Iron Works.

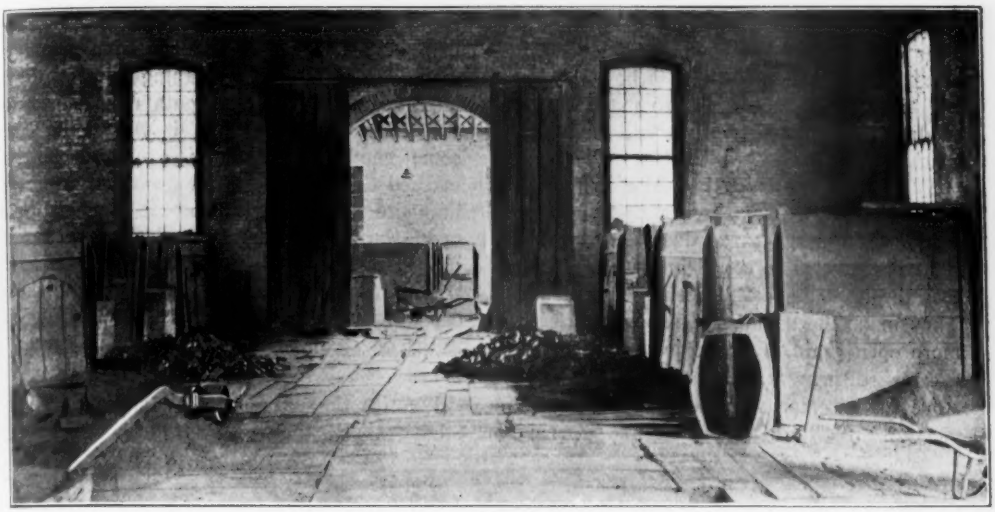
We present herewith some views from the Rhode Island Malleable Iron Works at Hills Grove, R. I. The greater part of this plant was erected in 1867, and was the third malleable iron works to be built within the boundaries of the New England states, and enlargements have taken place from time to time in order to keep up the demand for their products.

An illustration of special interest is the girls' coreroom, which is located in the building by itself. An amount of neatness and cleanliness is shown which is found in but few core-rooms.

Some criticism has from time to time appeared unfavorable to having girls perform this kind of work, although it must be admitted that, if proper precautions be taken, nothing valid can be said against the practice. We are informed that in this case they not only make nice looking cores, but perfect ones.

In most malleable shops, as well as in gray iron foundries where light work is made, it is a general custom to let the molders do all the work; that is, dumping their own molds and

MOLDING ROOM, RHODE ISLAND MALLEABLE IRON WORKS.



ANNEALING ROOM. RHODE ISLAND MALLEABLE IRON WORKS.

delivering the castings at the gangway. In the Rhode Island Malleable Iron Works the molders simply do the molding and pouring off, all the balance of the work necessary on the floors, including the cutting up of the sand, being done by laborers.

The Krank's Korner.

I never could understand some of the things foundrymen do. For instance, one of their objects in life is to use as much scrap as possible and yet make soft castings. We all know, or ought to know, that a light casting requires a softer iron, or in other words, an iron higher in silicon and graphitic carbon than a heavy machinery casting. It is also well known that the majority of foundrymen in buying scrap will give preference to and pay an increased price for heavy machinery scrap.

Now, it seems to me that the man who made these heavy castings, which are now scrap, if he knew his business, made them

GIRLS' CORE ROOM. RHODE ISLAND MALLEABLE IRON WORKS.

from a mixture of iron which did not contain over one and a half per cent of silicon, and what I should like to know is how the buyer of this scrap can expect it to make small or medium sized castings that will be easy to machine.

Yet is it not true that nine out of ten foundrymen will pay higher prices for this heavy machinery scrap than they will for light or stove plate scrap, in spite of the fact that the latter is really much the softer iron? They make the mistake of supposing that the more open grain of the heavy scrap indicates greater softness than the close grain of the stove plate scrap. Of the two, the last will give by far the softer casting and, barring a slightly greater loss in melting through oxidation, it is really the most valuable.

* * *

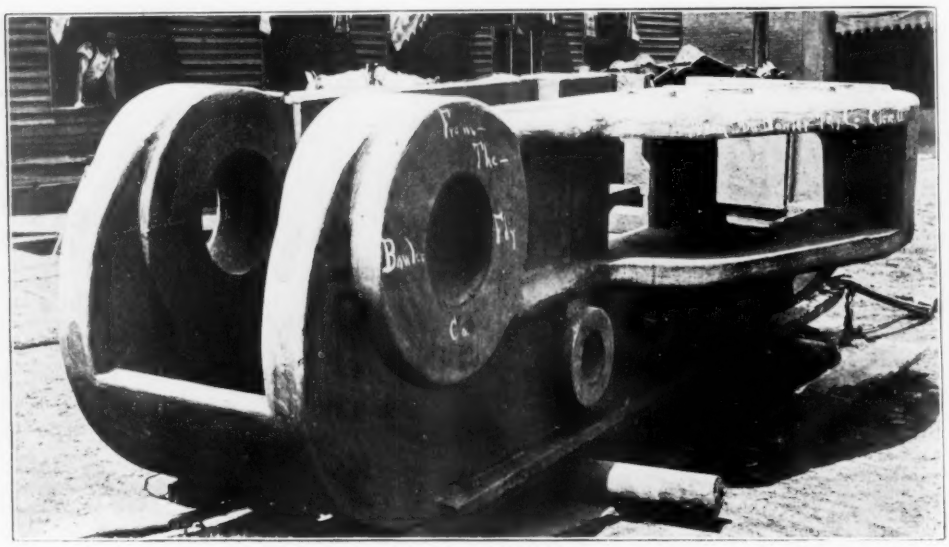
I had a talk the other day with a man who has had a large experience in melting iron with all kinds of contrivances and under more conditions than fall to the lot of us. He has got no hobby about the melting of iron, and believes that the common cupola, with properly arranged tuyeres, when intelligently charged and operated, is as economical a melting machine as can be made.

Our conversation drifted towards fluxes and some of the preparations which have been offered the foundryman from time to time to improve his iron. I expressed surprise that any one should invest in nostrums, which on the face of them carried every evidence of being fakes, when he told me of a foundryman who had used something of this kind, later abandoned it, and again resorted to its use under the belief that it was doing him some good. In explanation of this he remarked that the use of fluxes and the power they are credited with, depend a great deal upon the foundryman's mind. If the latter has faith in their curative ability he will stick to them, no matter what reasons others can advance against them. I am satisfied this is the only explanation which can be given.

* * *

I notice that my friend West wants to establish a college for foundrymen where they can be pumped full of wisdom relating to the foundry business exclusively. Mr. West proposes the radical departure of turning a foundry into a college instead of converting a college into a foundry. The latter has been, or is being, tried by a large number of educational institutions, but we do not know of any of these who give the student the practical experience he needs.

The trouble with all of these seats of learning is that they do not carry out their instruction in a commercial way. The student of a technical school who learns molding in a dress suit and is allowed to take four hours to put up a mold he should make in thirty minutes, knows less about actual molding and is far less competent to judge a piece of work



A CASTING FROM THE BOWLER FOUNDRY, CLEVELAND, OHIO.

than the ignorant Polack who must hustle or lose his job.

Most any school can put up some kind of a course which bears a strong resemblance to molding, and gives those who receive it a smattering knowledge of foundry practice, but as for making men who can direct affairs, we have yet got to look to those who learn by hard knocks and experience in a real foundry. Playing in the molding sand six hours a week at school may be an interesting pastime, but those who are fortunate, or unfortunate enough to be able to indulge therein, may as well forget all about it when they begin to work in a foundry where castings are made to sell.

I have every confidence that such a school as Mr. West proposes would be a good thing for any foundryman of perfect health, who has sufficient endurance to follow the program laid down. I am also sure that the manager of such a school will have his hands full and earn every cent of salary he can obtain. It is doubtful as to how far the management of shop crews can be taught. We all know that some shops are in continual friction with their workmen, and the experience of their neighbors, who get along year in and year out without strikes or trouble of any kind, does not seem to teach them a lesson.

Where Brother West will encounter the greatest difficulty will be in providing positions paying from $2,000 to $10,000 per year for his graduates. We doubt if there is a single foundry manager who receives this figure in any shop today, and it must be conceded that we have a few capable men left who fulfill every demand made upon them. Taking the inside figure it can be said that there are not three hundred foundries in the country who are paying the men at the head of their foundries two thousand dollars or over per year. As long as men can be obtained for less, who will turn out satisfactory castings for their employers, no material advances will be made. It is further extremely doubtful if one of my friend West's graduates, chockful of useful knowledge, would be able to turn out castings at a less cost than some of our foundries are now doing.

* * *

Where the millions upon millions of small castings made by our light work foundries are used is a puzzle to those acquainted with the volume of this trade. As an instance we may mention the automatic peanut selling machine, which made its appearance only a short time ago. The Paul E. Berger Mfg. Co. of Chicago Ridge, Ill., who are the inventors, advise us that they are disposing of these at the rate of five hundred a day. Take this and other novelties, and the number of castings used up daily gives employment to great numbers of molders, and in the aggregate involves considerable tonnage.

Has Your Cupola a "Diapasan?"

The foundry department of *The Tradesman* had an epileptic fit last month, and while relieving itself produced the following, which is almost equal in density to the genuine article supposed to come only from Boston:

"Four or five years ago, the general opinion was that the foundry capacity of the country was already far beyond what would be required for years to come. Four years ago, something—perhaps, political policy, or, mayhap, a fortunate blunder of industrial society, that swung it into the natural current of economic law, touched the stagnant ocean of industry, and lo! its continental bosom rose, and fell, and rose again, till every artery leapt into wakened energy, and all the streams of health throughout the quickened system swelled with red gladness for the thing that is—Life!

"Today, the winds of heaven sing the conquering arms of prosperous industry upon the thousand-stringed harps of steel that are rising everywhere throughout this fortunate land—harps of steel that the myriad genii of labor are rapidly transforming into temples wherein the exultant tenor of the anvil and the diapasan of the cupola, mingling with the myriad notes of happy toil, shall attest the wisdom of the men of faith, who know that man has, as yet, but climbed the foothills of the mountains of opulence, beyond whose crests stretch the illimitable plains of universal plenty!"

Lots of Gas.

W. H. Wiley, secretary of the Commercial club, has received a communication from the owners of a brass foundry who desire to locate in Marion, if the proper inducements are offered. It is a large concern and different from any now in the city. While it would be worth considerable to the city it is thought that the only inducement that can be offered is that of free gas. Where the plant is now located they have no gas.—*Marion (Ind.) Chronicle.*

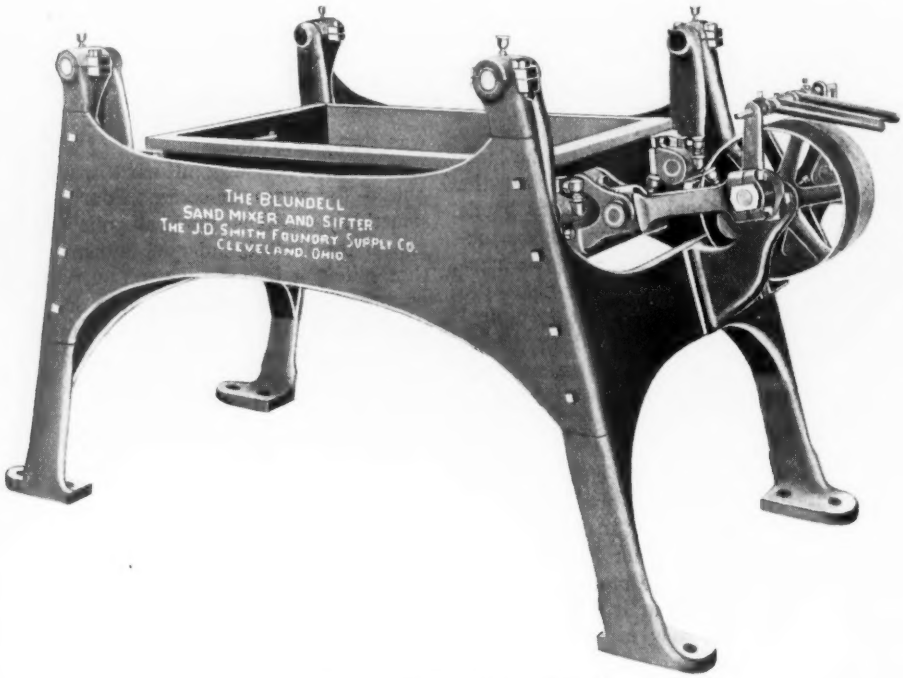
The Blundell Sand Mixer.

We show herewith an illustration of a sand mixer designed by F. Blundell, superintendent of the Taylor & Boggis Foundry Co. of Cleveland, Ohio, and manufactured by The J. D. Smith Foundry Supply Co. of the same city. It is claimed that while many sand sifters of various designs have been built, none have really performed their duty as sand mixers.

In the Blundell machine the riddle box is held in position by a flange entirely surrounding it, which overhangs the riddle box frame and is prevented from any lateral movement by strong pins on side of riddle box which engage in a slide fastened to the inside of riddle box frame. A reciprocating motion is imparted to the riddle box by means of a crank and connecting rod which give a travel of three inches and develops a backward and forward motion describing the arc of a circle. It is claimed that this peculiar motion permits the machine to mix the sand much better than can be done by any other method.

The machine is built low enough to insure easy shoveling, yet so aranged that its lowest part is high enough to admit a wheelbarrow underneath.

Every point liable to wear is babbitted and capable of adjustment, thus insuring a long life in the machine.



THE BLUNDELL SAND MIXER.

A View of Co-operative Foundries.

The great steel strike is settled, cold weather and consequent peaceful settlements of the smaller disagreements are approaching. Thoughtful men will now give methods for the prevention of like disturbances in the future more careful and dispassionate attention.

The one lesson which stands out with such clearness and evident truth as to make it impossible to overlook it, is the proposition that only financially responsible persons or bodies should become parties to agreements between the buyer and seller of labor.

Every experienced business man instinctively recoils from dealings or contracts with irresponsible parties. Such contracts entail responsibilities on the man of character and standing, but bring no added security to him, as he has no recourse in case such contracts are broken.

How then can we elevate labor to such a level that it shall be recognized as having something to forfeit as well as gain in case contracts are broken. It has been repeatedly stated that Mr Morgan has set aside millions

of dollars' worth of steel stock for the purpose of selling it at bottom prices to skilled workmen; whether this be true or not, co-operation is making its way into the practical economics of this country.

This century, the writer believes, will see its development in the same manner that the last century saw the development of the stock company.

Labor is blindly groping, but does not know how to lay hold of what it knows to be its due. Skilled labor must receive a larger return than at present of its own earnings, and the coming years will see this accomplished by some means.

The principal element which is hurrying forward this delightful consummation is the public school. Without that intelligent and sober thought which education fosters, co-operation is impossible. The term so often used in connection with labor troubles, "hot-heads," is usually only another name for ignorance.

There are other vital elements necessary for successful co-operation, but reasonable and skillful workmen are the foundation of the permanent structure.

The writer has seen both successful and unsuccessful co-operation and will outline a system which has proved successful. This system he knows to be practical for foundry purposes provided the men are such as have been called for in the foregoing passages.

We have seen a business expand in a few years from a capital such as almost any body of sober, skilled men could subscribe to ten times the original investment. A careful, conservative management will pay for the growth out of the profits of the business.

The character of the men constituting a co-operative management give the whole business its character as in any "old line" company.

Let there be two chief officers styled respectively President, or Manager, and Secretary-Treasurer. Fifty per cent of the stock to be owned by these officers, who are responsible for the management. Ten to twenty per cent of the stock to be owned by foremen of departments. This percentage will be varied according to the size of the plant and the ability of these department heads to subscribe. Thirty to 40 per cent, or the balance, to be subscribed for by the skilled workmen, according to their ability to pay for it.

There must be no confusion of station or position because of the co-operative feature. A board of directors consisting of five members would naturally be made up of the two managers, foundry foreman, and two molders.

The managers must possess energy, ability and character. The one with his experience in his trade and the other his business experience. Their duties should not conflict or overlap so as to cause friction. They will then be in a position to exact obedience of their employees and co-operators and thus preserve economy of operation. They will be free for that quick and decisive action which prevents loss in times requiring celerity and avoid the costly clumsiness of large bodies.

A broad-minded, sympathetic and charitable disposition must characterize the managers. The temptation to derive any excessive or unearned remuneration will surely mark the defeat of the system. While this may be true in the long run of any business, it will speedily ruin the co-operative company.

The legitimate earnings on the stock of a properly conducted co-operative foundry should be such as to make their positions attractive even with small salaries.

The distinctive benefits accruing to such co-operative concerns and thus to all the co-operators, large and small, are:

1—The minimizing of superintendence. Eye service and poor work will not be tolerated by ever vigilant co-operators.

2—The warring elements of capital and labor are so thoroughly welded that the line of jointure is hard to find and impossible of separation, even where determined outside effort is made along this line.

When co-operating stockholders strike, as they have been known to do, it is because of some injustice or lack of management or ignorance on the part of the striker.

3—The beneficent effect on the characters of the men composing such companies is very noticeable. This is partly accounted for by the attraction such companies have for thoughtful men. Such men will leave good jobs to associate themselves with such movements. Especially is it true of foundries that the most valuable capital is a force of steady, skilled mechanics. These men, therefore, are acted upon and react upon each other in a constant current which produces a prosperous business.

In order to preserve among the co-operators the stock and earnings, the stock of retiring men is purchased and sold to other stockholders or to such men as may not have had opportunity to become stockholders but are deserving of recognition. This has proved to be feasible.

Many details have not been entered into in this short article that have been worked out in a practical way by actual experience. Some of them may be given later, as interest in the subject among progressive journeymen and foundrymen becomes more general.

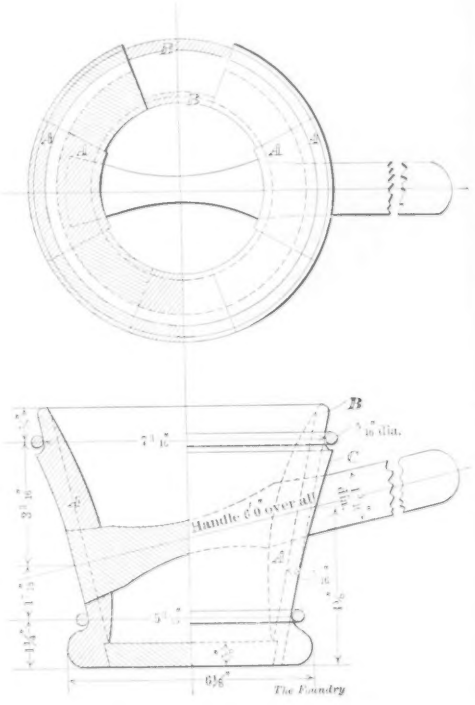
A Novel Vitriol Dipper.

I have thought that the readers of THE FOUNDRY might be interested in a description of a vitriol dipper, used in the foundry of the Brown & Sharpe Mfg. Co. of Providence, R. I., a firm which is noted for having every convenience for the comfort of its employees as well as economy to themselves, a merit which in turn is appreciated by their workmen.

This vitriol dipper is made of wood and a great deal lighter than the common copper dipper made with a long iron handle; at the same time it holds more vitriol and its general construction admits of its being used over large beds of castings without tiring out the one who uses it. I am told that in this particular foundry this improved dipper is handled by a one-armed man on the night shift who says that it has been a blessing to him. For the last year and a half these dippers have been employed at the Brown & Sharpe foundry and are so satisfactory in every way that they have entirely displaced copper dippers.

Their lightness and greater capacity makes them superior to the copper dippers and their use effects a saving of time. With fair usage they will outlast copper dippers from three to six months and are never out of order or in need of repairs, being good until worn out by contact with castings and not from the action of vitriol, which alone would make them last for at least two years. When made in dozen lots they cost less than half of the common copper dippers, so that a saving is effected on all points.

As shown in the sketch, the general shape of this dipper resembles somewhat a small butter or lard tub. It is made throughout of well-seasoned and straight-grained spruce, free from knots, without nails, screws or other fastenings except two cast brass bands, 5-16 inch in diameter, which are dipped in lead for protection from the action of vitriol, the shape of the dipper being such that they cannot come off. Eight staves, one like B, five like C and two like A, are used. The latter are wider and thicker than the others where the handles pass through them. This is 1 5-16 inches on the outside, but square where it goes through the sides. It is fastened to the dipper after the manner of a pickaxe handle and cut away to give more space inside. As soon as the dipper is put into use the material swells to a certain extent, thus insuring a tight fit everywhere. The bottom has a taper on the edge with small shoulder: it is built up over a form in the lathe, the last stave driven in being of a parallel thickness, see B, binding the whole securely, when it is turned up on the outside.



A NOVEL VITRIOL DIPPER.

ROBERT G. COGSWELL.

Machine Cast Foundry Pig Iron.*

Pig iron cast in iron molds is known by various names in the trade, such as "chilled pig iron," "iron cast in chills," "machine-cast pig iron," "sandless pig iron," "sand-free pig iron," etc. You are all familiar with the older method of casting pig iron in sand. The stream of iron coming from the furnace and passing down the center of the casting house, is turned to fill the first row of sand molds, usually located at the far end of the casting house, al-

*From a paper prepared for the Philadelphia Foundrymen's Association, by Albert Ladd Colby, Metallurgical Engineer of the Bethlehem Steel Co

though at some furnaces the bed nearest the furnace is filled first. When one row or bed of molds is nearly full, a gate is opened and the iron passes from the central "runner" into the second row, etc., until the cast is completed. The main stream is called the "runner;" the feeder to each row or "bed" of molds is called the "sow," and the sand molds branching off from the "sow" are the "pigs."

No one can be about a blast furnace very long without having the difficulties attending the casting of pigs in sand brought forcibly to his notice. Furnaces sometimes smelt and reduce the ore irregularly, so that there are times when the casting house is hardly cleared and made ready for another cast before the furnace should be again tapped. This is especially true if the skimmer has been washed away in the previous cast, and much of the iron covered over with a mass of cinder, so that the work of breaking up the hot iron and carrying it out of the casting house has been unusually hard. Work on the hot pig beds is severe at best, and there is always trouble in getting laborers to stand this heavy work with its rapid changes of temperature especially as it means work every day in the year, including Sundays and legal holidays.

With a small product of say, 100 tons per day, the casting of pigs in sand is not so serious a matter, but some better method of casting became absolutely necessary with the modern furnaces having a daily output of 300 or 500 tons, or even more. As Uehling says, "Necessity is the mother of invention," and the casting machine came into existence through sheer necessity, not to say desperation.

As far as I know, seven different forms of pig iron casting machines have been built and operated. The Uehling machine, designed by Mr. H. A. Uehling, was first put into successful operation at the Lucy Furnace of the Carnegie Steel Co., in September, 1896. Heyl & Patterson, Pittsburg, designed and erected for the Cambria Steel Co. another form of casting machine, which was put into successful operation in February, 1899. Mr. Davies designed and successfully operated a casting machine at a blast furnace plant in Canal Dover, Ohio. Mr. John M. Hartman, Philadelphia erected a casting machine at the Hollertown furnaces of the Thomas Iron Co., which was first successfully operated on June 23rd 1900. Mr. Erskine Ramsey, of Birmingham, Ala., designed another form of casting machine for the Tennessee Coal, Iron & Railroad Co.

In England, Mr. R. H. Wainford designed and erected at the Clarence Works of Bell Brothers, Middlesbrough, a casting machine which has since been referred to as "The Bell Clarence Pig Casting Machine," and finally, Karl Orthof Donawitz, near Loeben, in Styria, has designed still another form of casting machine.

At some blast furnaces, both at home and abroad, iron molds are used instead of molding the pigs in sand. This has been the practice for many years at the charcoal blast furnaces of Sweden.

ADVANTAGES OF MACHINE CAST PIG IRON.

The advantages of machine-cast pig iron to the makers of basic open-hearth steel are now universally recognized. The number of basic open-hearth furnaces receiving molten iron from a mixer, or direct from the blast furnace, or in some cases from a cupola, is on the increase. In cases where the iron is charged as pigs, the machine-cast iron is always called for, and sand-cast basic iron accepted only at a reduced price. With a machine-made iron there is no sand to attack the basic furnace lining. The higher proportion of combined carbon unites during melting more rapidly with oxygen than the graphite does, the bath when melted is lower in carbon than when using sand-cast iron, and hence more quickly converted into steel. These advantages in brief mean less fuel and increased output.

In puddling furnaces the machine-cast iron is also more advantageous than the sand-cast iron. The variable quantity of silica, with some little alumina, added to the bath in the form of sand adhering to the sand-cast pigs, causes irregularities in the basicity of the puddling cinder, and hence irregularities in the amount of phosphorus and sulphur removed. With machine-cast iron the basicity of the puddled cinder is governed more closely by the silicon in the pig iron and the silica in the "fix" causing greater uniformity in the composition of the cinder which in turn gives more uniform product and tends to prevent sudden and irregular cutting of the furnace linings. The increased proportion of carbon in the combined state in the machine-made iron is likewise an advantage, as the puddling operation is thereby shortened without detriment to the product.

In the use of Bessemer pig iron and of low phosphorus pig iron, whether melted in the cupola for the Bessemer converter, or melted in an acid open-hearth furnace, the same advan-

tages result by the use of machine-cast iron as have already been outlined above.

It is, however, the application of machine casting to foundry pig iron with which this audience is most interested. Let me first call attention to the economic advantages resulting in the use of a machine-made foundry pig iron, and then speak of the difficulties attending its introduction in the foundry trade.

In purchasing a machine-made foundry pig iron, the customer will receive 2,240 pounds per ton of iron shipped; there can be no dispute about short weights and that abomination, the "sand ton" of 2,268 or 2,256 pounds per ton is abolished. The amount of sand adhering to iron cast in sand varies greatly. When the iron is loaded directly from the casting bed and only has a short haul to the foundry, the sand on the pigs is excessive. If loaded from stock and hauled a considerable distance, more of the sand shakes off before the pigs reach the cupola platform, but at best that remaining is a detriment and frequent cause for dispute in weights and an expense in melting.

In melting machine-made iron, the founder will find that he uses less limestone and that therefore less slag is produced. This means less fuel to dissociate the carbonic acid gas in the flux, and less fuel to melt the smaller amount of slag produced; also less loss of iron in the slag. The machine-cast iron also melts easier, an item which gives a further saving in fuel.

The melted iron is cleaner, contains no dross, and that frequent cause for defective work, "dirty iron" is absent when using a machine-cast pig iron.

Another advantage of machine-cast iron is that the pigs of the cast are more nearly alike in chemical composition than pigs of a cast of iron run from the furnace into sand, and furthermore, there is a greater uniformity in the different parts of a machine-cast pig than in sand-cast pigs. This greater regularity of the different parts of a cast is due to the fact that the furnace is tapped into twenty-ton ladles and the iron is thus mixed before casting the pigs. These are more uniform in composition because they solidify more rapidly in the iron molds of the casting machine, and hence there is much less time for the impurities to segregate towards the top and center of each pig.

FOUNDRYMEN'S OBJECTIONS TO SANDLESS PIG IRON.

The author has met with four objections made by foundrymen to iron cast in chills, whether in the metal molds substituted for the beds of sand in the casting house or the molds of the casting machine.

First—The prejudice against all machine-cast iron, due to the sale of some sandless misfit basic pig iron for foundry purposes.

Second—The large size of the machine-cast pigs.

Third—The close-grained fracture as compared with the fracture of sand-cast iron.

Fourth—The difficulty in drilling the pigs for analysis.

These will be briefly discussed in turn.

First—There is a well-grounded prejudice to machine-cast pig iron, owing to the sale to foundrymen of misfit basic iron cast in chills, which, although perhaps high enough in silicon, is also often high in sulphur. Doubtless in many cases this iron had not the best analysis for the purpose for which it was sold to the foundryman. It was perhaps too high in sulphur, and very likely too low in total carbon for the kind of casting into which it was made. The unsatisfactory result attending its use has given a bad name to all machine-cast iron in general, and has prejudiced the foundrymen against its use. This is unjust to those furnaces making first-class machine-cast foundry iron, but the prejudice is not to be wondered at; it can only be overcome by a straightforward explanation of the facts; and by giving a guaranteed analysis of the standard machine-cast foundry pig iron offered.

Second—The large size of the pigs of machine-cast iron have been objected to. Some of the casting machines make a large pig, too heavy to conveniently handle on the cupola platform and too large for economic melting in small cupolas. The Bethlehem machine-cast pigs, however, weigh not over 90 pounds each, and are of such a shape as to be readily broken if desired to be melted in very small cupolas.

Third—The main stumbling block to the introduction of machine-cast pig iron in the foundry is the appearance of its fracture; its looks are against it. There are two ways of meeting this objection. First, by proving to the foundryman that the machine-cast iron, although having a close-grained fracture, will make, if it has the right chemical contents, as soft and as easily machined a casting as an open-grained sand-cast pig iron of the same analysis.

The close-grained fracture is due to the quick-cooling and to the temporary conversion of considerable of the total carbon into the combined form, with a corresponding temporary reduction of the percentage of graphite.

The change of carbon is caused by the chilling action of the iron molds of the casting machine, and the further and deeper chill caused by the sudden cooling of the hot pig by immersion in a bath of water. This difference in the proportion of combined carbon is illustrated by the following analysis of a cast of Bethlehem iron, a portion of which was cast in sand, and a portion in the casting machine.

	Cast Vertically.	Cast Horizontally.
Test ingot cast from machine-cast pig	17,000	17,000
Test ingot cast from sand-cast pig	16,300	18,000

Castings made at the same time as the above test ingots, from remelted sand and remelted machine-cast iron, were machined with equal

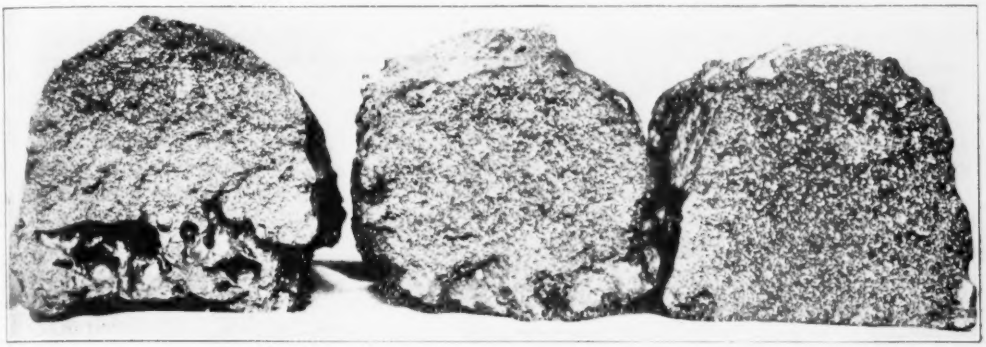


FIG. 1. FIG. 2. FIG. 3.

FRACTURES OF THREE PIGS OF THE SAME CAST OF IRON.
Showing dissimilar appearance of sand cast iron of same composition.

	Comb. Carb.	Graph. Carb.	Total Carb.	Si.	S.	P.	Mn.
Fig. 1. Beginning of cast	.75	3.52	4.27	1.81	.018	.083	.50
Fig. 2. Middle of cast	.61	3.32	3.93	1.81	.017	.084	.51
Fig. 3. End of cast	.68	3.52	4.20	1.80	.014	.082	.52

Cast No. 7,602	Sand Cast.	Machine Cast.
Combined Carbon	.250 per cent.	.920 per cent.
Graphite Carbon	3.210 per cent.	2.460 per cent.
Total Carbon	3.460 per cent.	3.380 per cent.
Silicon	3.00 per cent.	2.99 per cent.
Manganese	.95 per cent.	.95 per cent.
Phosphorus	.770 per cent.	.773 per cent.
Sulphur	.041 per cent.	.041 per cent.

The increased percentage of the combined carbon, the uniform close grain, and in some cases the increased density of the machine-cast pig iron gives higher tensile strength on specimens cut from the chilled pigs than on those cut from the sand-cast pigs. This increased tensile strength is misleading, for it only exists in the pig itself. When both the machine and sand-cast pigs of the above cast, No. 7,602, were remelted separately in a cupola and cast into similar-sized test ingots, standard test specimens threaded on each end, and of an area at point of fracture of one square inch, gave the following results:

Standard U. S. Army Test specimen cut from	Tensile Strength lbs. per square inch.
Machine-cast pig	41,000
Sand-cast pig	15,000

ease and showed similar fractures. The following analyses show that the excess of combined carbon in the machine-cast pig disappeared after remelting:

	Carbon. Combined.	Graphitic.	Total.
Sand-cast pig	.250	3.210	3.460
Machine-cast pig	.920	2.460	3.380
Test ingot cast by remelting sand-cast pig—			
Cast vertically	.368	3.022	3.390
Cast horizontally	.470	2.930	3.400
Test ingot cast by remelting machine-cast pig—			
Cast vertically	.257	3.100	3.357
Cast horizontally	.336	3.028	3.364

Another practical illustration of the fact that the chill in the pig iron does not reappear in the casting made therefrom, if the chemistry is right, is the use of old chilled iron car wheels by foundrymen. At one time when old car wheels were cheap the speaker knows of an instance where 5,000 tons were purchased by a maker of cas iron pipe. The wheels showed

a deep chill, but the chill did not show in the pipe. The wheel made strong pipe, but it was uniformly gray in fracture and contained no hard or chilled spots.

The second method of meeting the objections of the appearance of the fracture of machine-cast iron, is to submit to the foundryman facts showing how often the appearance of the fracture of sand-cast iron is misleading, and prove to him that chemistry is the only safe guide to uniform success in the foundry. How can regular results be expected in the foundry when buying pig iron by grade, when the published analyses of nine different brands of say No. 1 Northern coke foundry iron vary as follows in silicon: 1.75 per cent, 2.00, 2.40, 2.53, 2.70, 3.00, 3.08, 3.25 and 3.44? These analyses, as well as the following, were selected from S. R. Church's book entitled "Analyses of Pig Iron," published in May, 1900. Notice the wide variation in silicon in nineteen different brands of No. 2 Southern coke pig iron: 1.73 per cent, 1.92, 2.01, 2.14, 2.16, 2.25, 2.32, 2.40, 2.42, 2.45, 2.47, 2.50, 2.88, 2.90, 2.92, 3.05, 3.12, 3.30, and 3.79. These variations could be proved by further quotations to exist in all the different grades of both Northern and Southern coke foundry pig irons.

In fact, the argument can be narrowed down to the different shipments of No. 1 iron of the same brand and from the same furnace. Let the foundryman have each car of his No. 1 iron, purchased only on grade, analyzed for silicon and sulphur for, say two months, and the wide variations in the figures will surprise him. The converse of the above statement also holds good, for often iron of the same brand and of widely different grade, as shown by the fracture of the sand-cast pigs, is exactly alike in chemical analysis. A striking example of this fact is shown in the accompanying illustration of the fracture of three pigs from different parts of the same cast of a Western Bessemer pig iron.

Why should a foundryman continue to purchase iron by the appearance of its fracture when every conscientious furnaceman will admit to him that wide variations exist in the composition of the same grade of iron, and that often the foundryman pays a higher price for a No. 1 iron than there is any necessity for?

The author does not mean that the foundryman can safely ignore the fracture of sand-cast pig iron if he does not include the total carbon in his chemical specification, especially if he must make very soft castings, but he does mean to have it understood that if the foundryman specifies the correct silicon, sulphur, and total carbon, with possibly manganese desired, that he can safely ignore the appearance of the fracture, and stoutly refuse to pay a higher price for an iron of the composition he desires, because it happens to have a No. 1 fracture.

Among the advantages claimed for machine-cast iron, some have made the statement that the appearance of the fracture of machine-cast iron is a safer indication of its quality than with sand-cast iron. The value to the furnaceman of the chill cup test, used at some furnaces as an indication of the sulphur and silicon contents of the pig, is cited in illustration of the above statement. The speaker thinks, however, that it will be found in actual practice that the fracture of machine-cast pig iron, especially from different furnaces, is an unsafe guide, and should not be depended upon by the foundryman as a substitute for the chemical analysis. The size and shape of the molds used in different makes of casting machines, and the different methods used for cooling the hot iron by water, will probably make it impossible to compare the fractures of machine-cast iron from different furnaces.

Fourth—The fourth objection which the speaker has heard made about machine-cast iron, is the difficulty in drilling the pigs for analysis. This brings up the general question of how to sample pig iron, to which important matter I will ask your attention in concluding my remarks.

SAMPLING PIG IRON FOR ANALYSIS.

With the more general incorporation of chemical specifications in contracts governing the sale of pig iron for all purposes, the question of how to determine whether the shipper has lived up to his contract becomes more important.

If seller's and buyer's chemists do not agree, the first step should be an example of samples to check accuracy of analytical methods; in some cases the service of a reference chemist will be required. Such a test is only just when the sample drillings are ground and thoroughly mixed, and when a sufficient quantity for duplicate analysis is distributed to each chemist.

Marked differences between the furnace analysis on which the casts of pig iron are selected for shipment on a certain contract, and the report of the buyer's chemist on the cars of iron received will more often be due to *improper sampling* of the iron, than to inaccurate analytical work. Everyone knows of the unavoidable variations in the chemical composi-

tion of different parts of a cast of sand-cast pig iron, or for that matter in different parts of a single sand-cast pig.

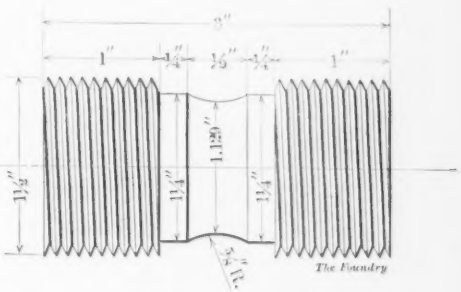
The furnaceman must consider *each cast of iron as a unit*, and should spare no pains or expense to obtain a sample representing the true *average* of the cast. He cannot honestly claim to have done this unless he has taken four or preferably six samples of the molten metal during casting; when the casting machine is used the sampling can best be done as the large ladles of iron are being emptied into the molds, by filling a small test ladle at stated intervals. If the contents of these test ladles is cast into small ingots, the sample analyzed should consist of an equal quantity of drillings from each of the four or six ingots; if each small ladleful is poured into water, the same number of shot from each sample should be pounded together to make the average sample of the cast. In filling an order the furnaceman must consider *each cast as a unit*, and select those casts for shipment, the furnace analysis of which fall within the customer's specification. As cars vary in size and as the railroads always insist on having them loaded to nearly their full capacity, it is impossible to ship each cast of pig iron separately, for it may weigh less but more often considerably over the capacity of the car; the best the furnaceman can do therefore, is to load casts of similar silicon and sulphur contents on the same car.

It is obvious that the customer's chemist when sampling the iron must consider *each car load as a unit* and from what has been said it would be manifestly unfair for him to condemn a car of iron on the analysis of drillings from only two or three pigs. A good routine method of sampling, consists in selecting two pigs from the surface of the carload of iron at points equally distant from each end of the car, and two more pigs from the bottom of the car, preferably at different distances from the end of the car. These pigs should be broken and drilled in the fracture, preferably by the use of a wide angle blunt pointed drill, two to three inches in diameter, using rather a slow feed so as to obtain uniformly fine drillings. If this requires a larger drilling machine, or more power than can be assigned to the task, a number of holes may be drilled in the face of each pig, using a smaller drill.

If the analysis of an equal portion of carefully mixed drillings from each of these four pigs shows a wide variation from the chemical specification under which the iron is purchased, the car of iron should not be condemned by the customer without taking a more thorough sample consisting of a dozen or better, twenty pigs, selected from different parts of the car. The pigs should be selected arbitrarily and no attention paid to the fracture. With sand-cast iron, sold on a guarantee of .050 sulphur, a customer could unfairly condemn many cars shipped by selecting only the pigs showing the closest-grained fracture, and by taking drillings for analysis, with a small drill, in the top part of each pig.

SAMPLING MACHINE-CAST PIG IRON.

When the iron is machine-cast the *proper* sampling of each car is a laborious undertaking. If low in silicon the iron is so deeply chilled that the pigs can only be drilled in the center, if at all; the presence of 1.00% to 2.00% of manganese also renders machine-cast iron



U. S. STANDARD SPECIMEN FOR CAST IRON.

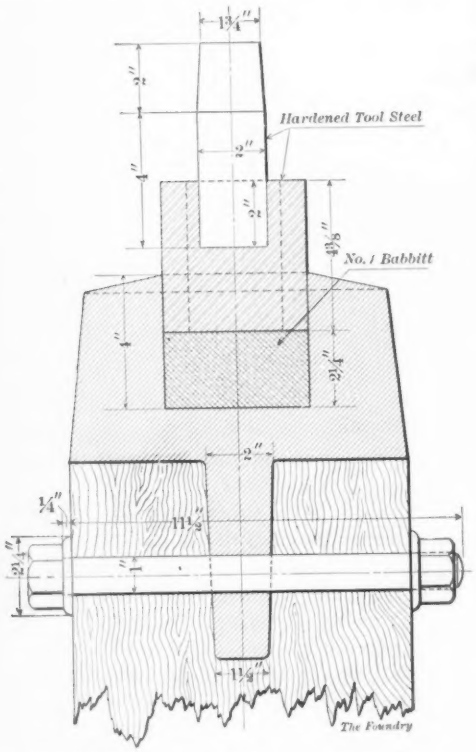
very hard to drill. When impossible to drill, the reduction of chips of the chilled iron to a powder in a steel mortar is a slow operation unless the laboratory is unusually well equipped for such work. The attached illustration shows a very convenient form of steel mortar and pestle with which samples of chilled iron can be pulverized.

Without for a moment denying the right of the buyer to check the furnaceman's analysis, the speaker believes the furnaceman has a much better opportunity of determining, by conscientious sampling, the true average composition of each cast of iron, and he ventures to predict that, with the more general introduction of machine-cast iron, the customer will purchase iron from furnaces where proper care is used in sampling, and then rely, with only an occasional check on the furnace analysis of the casts loaded on each car, which information should be given on cards tacked on the inside of each car, and also by postal card advices of each day's shipment from the furnace.

This suggestion does not apply to the closer

inspection necessary in some cases if the customer suspects that the furnaceman is shipping a little of his "Misfit" iron on the bottom of each car of pig iron guaranteed as "Standard." This dishonest practice, unfortunately carried on to some extent, is sure of detection sooner or later, and is sure to react seriously on the reputation of this furnaceman's iron in the trade.

If several cars of the same iron are to be placed in one pile in order to equalize the difference in the chemical composition of the carloads, the first car unloaded should be distrib-



STEEL MORTAR FOR PREPARING SAMPLES FOR ANALYSIS.

uted horizontally and evenly throughout the length of the proposed pile, the second carload similarly on top of this, and so on. Then by using vertically downward from one end of the pile, iron will be obtained which will conform very closely to the average analysis of the drillings from each car.

The greatest advantage which will result by the general introduction on the market of machine-cast foundry pig iron, in the speaker's opinion, is that it will tend to hasten the day when foundry pig iron will no longer be sold by grade, based on the appearance of the fracture, but will vary in price according to its chemical analysis, which is fair alike to producer and consumer.

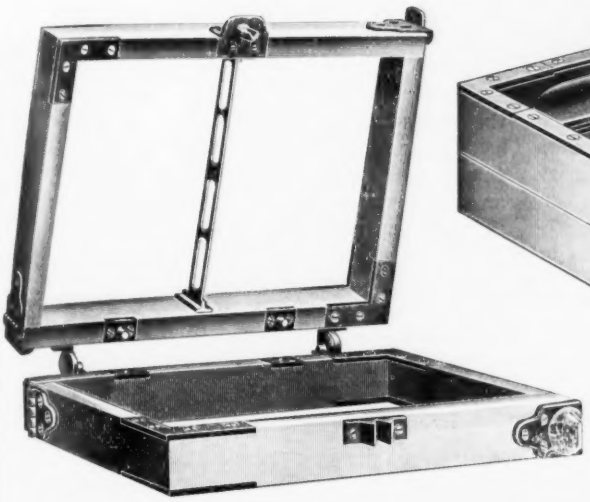
Some Inventions of Mr. L. W. Boutelle.

As superintendent of the iron and brass foundries of the New Home Sewing Machine Co., at Orange, Mass., the late Mr. Boutelle made several inventions calculated to better and increase the amount of the molder's output. Most of these were of course brought about by the special needs of that shop, but their growing use in foundries doing light work has demonstrated their practicability.

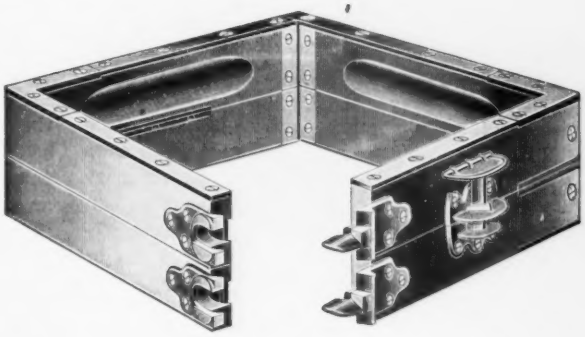
A special feature of the Boutelle Snap Flask is its coping device, whereby straight and difficult work can be coped almost as easily as plain patterns. In the illustration will be noted an inclined cam or sand shield combined, stapled to the cope and resting on extreme top of pins and made of a shape to fit the palms of the hands. By simply pressing down on these cams with the fingers placed under the ear plates, a true and perfect lift will result. With this device it is possible to lift the cope half an inch as straight as a die, thus avoiding much of the rapping incident to light castings and producing these more true to pattern.

The Telescopic Molding Sprue is intended to be used with molding machines. It is set in the usual way and when the mold is pressed the sprue shuts together and again resumes its original height when the press-board is released.

The Flask shown in Fig. 1 is intended for castings which are too heavy to be molded and poured in the ordinary snap mold. Fig. 2 shows the two parts required with this flask, while Fig. 3 gives a view of the finished mold. From these it will be seen that the drag portion of the flask remains on the mold until this is cast and takes the place of separate jackets or bands. The parts are interchangeable and the cope is also provided with an attachment by which bands may be inserted in the cope if these are necessary. The pins are of a unique design, the handle being at the extreme end of the pin, giving the molder better control of the cope on difficult work. The drag portion of this flask is easy to mold and fit up and requires but little filing after being cast from the master pattern. Its inside dimensions are an eighth of an inch larger than the inside of the cope which permits it being



ROLL-OFF SNAP FLASK.



BOUTELLE'S SNAP FLASK WITH COPING DEVICE.

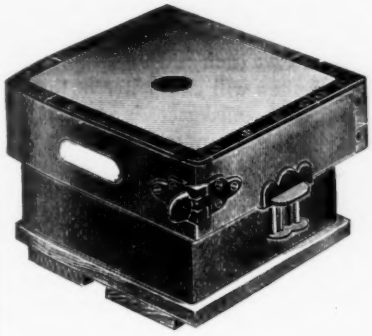


FIG. 1.

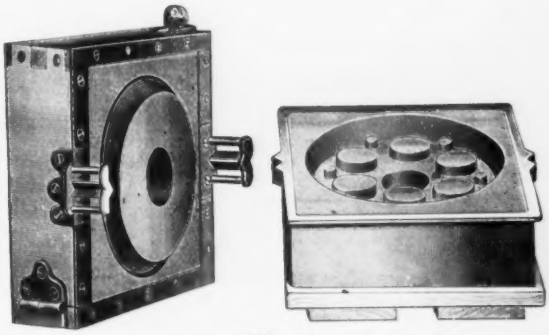


FIG. 2.

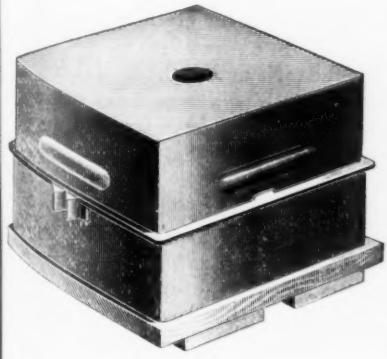
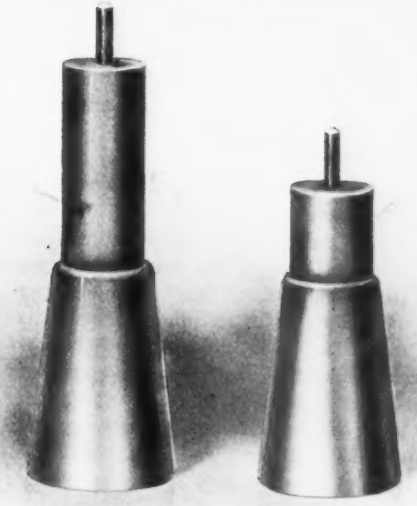


FIG. 3.



TELESCOPIC MOLDING SPRUE.

SOME INVENTIONS OF L. W. BOUTELLE.

slipped over the cope as soon as the mold is poured and before it gets too hot to handle, leaving a perfect snap mold to be dumped at leisure.

Another illustration shows an improved form of roll-off snap flask adopted for a class of larger work than is suited to the ordinary snap flask. The cope has a loose cross-bar, set in sockets, made with sharp edges, requiring no tucking, and shallow copes can be used without any danger of sagging, thus making a superior flask for light castings having much surface. The roll-off hinges are of special design, working free and smooth and with no clogging of sand. Between these hinges are two dowel plates and pins, keeping the flask from any possible shifting when closed. On the front side is a V-shaped pin, combined with a handle for lifting or rolling the cope. This pin is adjustable, and when the flask is closed, fits snug into an open V slot in the nowel, and any possible wear can be taken up in a moment's time.

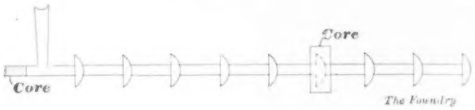
B. F. Perkins & Son of Holyoke, Mass., are the manufacturers of the equipment described in this article.

Multiple Molding.

Several examples of multiple molding have appeared from time to time in THE FOUNDRY, and I have thought that perhaps some one of its readers might be interested in the method I follow in casting bolts and similar shapes in brass and low carbon steel. I make various lengths and sizes, round and true, with a one part flask, casting the heads on bolts and various projections as wanted.

In practice I take the drag part of a flask about 12 feet long, 18 inches wide and 7 inches deep, placing this on a bottom board, one end being elevated about 6 inches from the floor. In the elevated end of the drag, about 3½ inches from the bottom board and about 2 inches apart, bore holes to admit the patterns which are made from cold rolled steel of the desired diameter. I take six or more of these rods, say ¾ inches in diameter and about 12 feet long, and after ramming the drag half full of sand I lay all the rods in the flask, leaving one end extending through holes in the elevated end. The heads or other projections, which are desired to be cast, are made in cores, through the center of which there is a hole the exact diameter of the rod. These cores are slipped over the patterns and located in their proper places when the mold is rammed up, a general conception of which may be obtained from the sketch accompanying this.

After the cores are placed in position the mold is rammed up and a gate connected with the pattern at the elevated end. Care should be taken to have the lower end of the gate half round, so that it will fit the rod and not leave any chance for dirt to fall into the mold through improper connections. When the mold is struck off level on the top a bottom board is bedded on same and the whole clamped together, after which the patterns are pulled out through end of drag. Pieces of cores are inserted in the holes, left by the



patterns, back of the gate to prevent the metal from coming out at that point. A little sand rammed behind the core completes the job.

It is advisable to cast each rod or string of bolts separately, as they will run better in this way. The reason cold-rolled steel is used for patterns is because this is more perfect than other shapes which could be bought for this purpose. I have also used chills made in halves to form the heads. By the method just described I have been able to obtain fifty or more complete bolts from each flask, depending upon the length of the bolts wanted.

E. C. WILLS.

Repairing an Engine Under Difficulties.

Back in the seventies I was in the employ of one of the iron companies of Northwestern Michigan with headquarters at Negaunee, filling (or attempting to fill) the position of master mechanic.

In those days the tools and methods of doing work were so radically different from what they are now that I think perhaps some of the things we did and how we did them might interest at least a few readers. How useful they may be, I cannot tell. I suppose, however, the time has not gone by when men are liable to be called on to do odd jobs with poor facilities, and no doubt there are many machinists nowadays filling positions where, more or less frequently, in order to keep things running, they must do things not strictly in the line of machinists' work.

Our company owned and operated three blast furnaces, making charcoal iron; also eight or ten iron mines in various stages of

development scattered over a territory of about one hundred square miles. The two old pioneer furnaces were located at Negaunee, and here we had a small machine shop equipped with a fairly good lathe of about 48-inch swing and 20-foot bed, an 18-inch lathe and a 40-inch drill press.

In this shop we did all the repairs for the furnaces and mines. There were three of us to do the work in the shop and the outside jobs at the mines and furnaces. We had no foundry, nor was there one nearer than Milwaukee, Wis. To keep up the repairs necessary for the various plants it was often necessary to have castings made quickly, and for this purpose we used one end of the pig bed in the casting house of the furnaces. In one corner we kept a lot of molding sand which was always ready for use. Many of the castings we made in open sand molds and others in flasks, always sinking the mold below the surface of the pig bed, to admit of a runner being cut from the main runner of the pig bed direct to the mold. Many a casting we made there, some good, some bad—more bad than good, if I remember rightly. We always took the precaution to make two or three molds of each piece wanted, particularly if we were in urgent need of the casting. None of us were molders, and now, looking back, I can readily see that we were not first-class machinists, rated as machinists are now. We were young and energetic and perhaps undertook to do things that men of more experience would have laughed at, and, of course, we did make mistakes and often bad failures, but the manager seemed to overlook them and encouraged us to keep on trying.

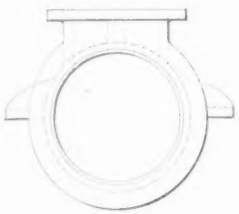


Fig. 2

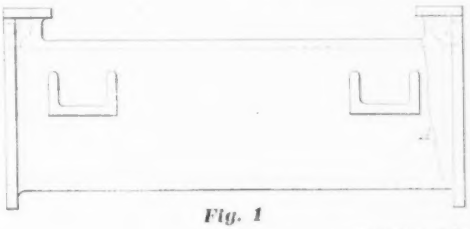


Fig. 1

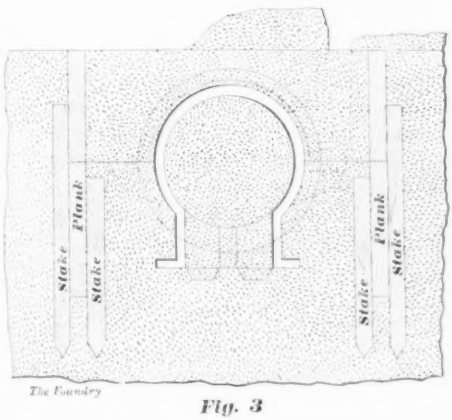


Fig. 3

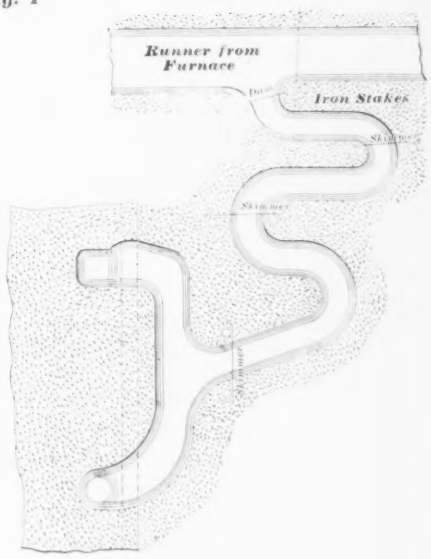


Fig. 4

The two young men associated with me were the best-natured and most willing I have ever met—nothing could scare them, and if nine, ten, twelve or fifteen hours per day would not accomplish the needed repairs they would work twenty-four hours without a murmur.

One of the blowing engines was a regular curiosity. The steam cylinder on this engine

was 24x72 inches. (See Figs. 1 and 2.) While running, the piston broke at the end of the thread just inside of the nut holding the piston head in place. This must have happened just at the start of the piston toward the back end of the cylinder, forcing it with the full pressure of steam against the cylinder head, breaking the cylinder completely in two, as shown at *A*, Fig. 1.

The shutting down of a blast furnace at any time incurs great loss. Of course this is much greater when the stop occurs without preparation of any kind. We took great pride in keeping the engines running constantly, so that our weekly reports, when forwarded to the New York office, might show no shutdown for repairs. This accident would probably cause a stop of days or even weeks, as the engine blowing the other stack was barely sufficient for its own work.

There were but two things that could be done. One was to send to Milwaukee and have a man come up, make measurement and get the work done there; the other, do the job ourselves, casting the cylinder in our makeshift foundry, using the melted metal from the furnace still running.

The manager reluctantly consented to let us go ahead. Our carpenter was put to work on sweeps, and the three of us went to work on the mold and cores and also on a mold for a boring bar and head.

We first dug out a pit deep enough to admit of forming the mold completely below the surface of the pig bed. We then set two 3-inch planks on edge, parallel with each other and far enough apart to admit of molding the cylinder with sufficient margin of sand on both sides. These planks served the purpose of guides for the sweeps. We made two sweeps—one the diameter of the outside of the cylinder, the other the diameter of the core. We first swept out the body of the cylinder and bedded in the flanges, then swept out the core prints and bedded in the parts forming the steam and exhaust ports and lugs. The cope half of the mold was swept out in the same way and both halves well dried with charcoal fires. The core was plain except for the port cores, which we made in a box, setting them into the main core. We dried the core with charcoal fires also.

The difficult part of the work was handling the cope and setting the core. This we did with a set of rope tackle, putting up a tripod and using what we called a crab winch to which we attached the tail rope. This served to handle the cope and core and also to lift the casting out when it was ready to be removed. Fig. 3 represents a section of the mold, and Fig. 4 a plan of the runner, showing dam and skimmers. The object of this form of runner was to clean the iron as much as possible before it entered the mold. We were about five days, of fifteen hours each, completing the mold for the cylinder. The mold for the boring bar was made in one day, and the bar cast at the midnight tapping of the furnace. When ready to cast the cylinder, we tapped the furnace, and allowed three or four tons of metal to flow direct to the pig bed. We then lifted the dam, shown by Fig. 4, and set it across the runner at the dotted line. The long runner and the skimmers seemed to have cleaned the iron quite well, as we found a fairly good casting when it was pulled out.

We set the cylinder in the lathe with the stuffing box end next to the face-plate and faced it by using the compound rest bolted to the face-plate. The other end we did not face, as time was too valuable to waste in turning it end for end or to make a facing arm to use on the boring bar. In order to make a steam joint on this end we used a gasket made of braided hemp, about ½ inch thick by 1½ inches wide. This, with plenty of red lead putty, made a good joint. We had no way of planing the steam and exhaust nozzles. These we chipped and filed the best we could, doing it while the cylinder was being bored. We had taken the precaution, when making the mold, to have the lugs set sufficiently high so that they might be shimmed up to place, rather than to have to chip them. The job was complete in 172 hours and the furnace running.

The cylinder was not a handsome casting, nor was it as perfect as we wished, but it did the work for several years, and was still in working condition when the engine was thrown out and replaced by one of more modern design.—[B. W. T., in *American Machinist.*

Foundry Costs.

I have read with interest the criticism on Mr. Cunningham's article entitled "Foundry Costs" by the Brooklyn pattern maker. I agree with what Mr. Cunningham says with reference to the impractical manner in which many patterns are constructed, and it is astonishing the number of pattern makers there are who have only a faint conception of the details of

the molding trade. I was also very much surprised to learn that only a few Scotch foundry foremen could read drawings. However, I am inclined to think that our Brooklyn pattern maker's experience has been limited. If such was not the case I do not believe he would make the assertion that very few foundry foremen can read drawings. Of course, we are bound to admit that there are botches working at the molder's trade as well as any other trade. But we do not relish the idea that seems to be fixed in the minds of many, that all that is required of a molder is "a strong back and a weak mind." I think that it would be a greater task for the average pattern maker to step into the foundry and make a casting than it would be for the average molder to make the pattern for the same. My idea of pattern making has always been that it is a part of the molding trade and every intelligent molder should understand it, and every foundry foreman should be able to instruct or advise the pattern maker of the proper way to construct patterns. The majority of pattern makers understand where draft is required on a pattern, also the location of the rapping plates, etc. But to make an economical job they must have the knowledge of what is the proper way to make the mold. The practical molder is the one that can decide such cases best, because he knows where a dry sand core will be better than a draw back or green sand core, where it will be the best to make a joint in the mold or pattern, what a mold will stand, and the amount of labor that will be necessary to secure the mold and take the vents off properly. I could mention many things that would prove that the molder's experience is of great value to pattern makers. I have in mind a foreman pattern maker, who has been a successful pattern maker and foreman for forty years. He has made the patterns for a company that we furnish castings to for the last thirty years, and is counted one of the best. With all of his experience in the business he never makes a pattern of any consequence without consulting the foundry. He often says that he knows we have to use the pattern and he wants to make it the way we think will be the best. Not only will he make new patterns to suit the foundry, but if we want any changes made in a pattern that he has made thirty years ago or yesterday he will make it. Now, I claim that the secret of this pattern maker's success is: "He has kept in touch with the foundry foreman." Strange to say, this pattern maker is a Scotchman, also. But, happy to state, he is still living. What our Brooklyn pattern maker says about using iron or metal flasks is very good; the writer has a great many in use daily. Still, I do not believe, as he states, that the metal flasks should become universal, because there are a great many light jobs that require a fair sized flask, and owing to the simplicity of the job made in them, it is possible for one to put up a large number of molds. Should these flasks be made of iron they would be much heavier and the molder would have to have help to lift them, which would reduce the number of flasks he could produce and cut into his working partner's time. So in such cases we might prolong the life of a set of flasks, but we would probably shorten the life of the molder.

Referring once more to the remarks about molders reading drawings, will say we make a great many castings in our foundry without the use of a pattern. The molder is given the blue print and never yet have we had to send for a pattern maker to interpret the meaning of the different lines and figures shown on the mysterious piece of paper. With reference to what the Brooklyn pattern maker has said about using paper in making partings, will say if he was compelled to make two or three molds a week that had to have an impression swept up in the nowel so the cope could be rammed up from it he would find that paper was a little better than parting sand. The above remarks are not made without the writer fully realizing that there are pattern makers who are capable of successfully running a foundry, as well as there are molders who are able to take charge of a pattern shop. For instance, the writer, who is a practical molder, has under his charge a pattern shop.

P. R. RAMP.

A Plea for the Old Molder.

In my travels I have noticed that the old foundrymen, the people who worked and learned the business from start to finish, have largely passed away, and their boys, who were brought up in luxury and had the advantage of a good education, have inherited the business and know nothing about it, but think they know it all. This is what disgusts mechanics who have worked 25 or 30 years at a trade and are still learning. It seems as if a man who can go tearing through the shop like a mad bull is considered to be worth more to a firm than a good mechanic. He seems to be chosen more for his ability to bulldoze molders into putting up more molds than for any in-

herent ability he might possess as a manager.

I find, too, that old molders are not wanted in the foundry business. I have found a good many old mechanics who are in good shape to work and their past experience certainly ought to make them worth something. If they go to look for work, the answer is, we have more old men of our own than we want now. It seems to me as if this is an injustice to the old men, and that a sliding scale of wages should be arranged whereby they can be employed and some favors shown them. The iron might, for instance, be delivered on their floors and lifts given them through the day which would help them over the hardest work in molding. The younger men in the trade should not forget what the old molders have done for them in the past, and I have yet to find a good, practical foreman who does not have a great deal of respect for the old molder.

J. EDWARDS.

A New Method of Tempering Molding Sand.

George K. Hooper of Dedham, Mass., has recently obtained a patent on a new method of tempering molding sand. It should be stated at the outset that this was conceived while the patentee was engaged in the developments of a continuous casting system in a large foundry. Mr. Hooper says that it is his belief that a uniform atmospheric condition is a necessity in handling the large quantity of sand used in a plant capable of using such a system where the sand passes from the hot mold back to the molder many times during a day's run.

It cannot be denied that difficulties have been found in properly tempering sand during its short progress from the cupola to the molding floor. Mr. Hooper proposes to temper the sand in a room or closed space in an atmosphere charged with a uniform proportion of moisture, which, during the tempering process is transferred to the sand. This he accomplishes either by means of admitting vapor to the mixing room or through the medium of atomizer-sprays.

Pressure in Molds.

Referring to an article entitled "A Molder's Factor of Safety," which appeared in the September issue of THE FOUNDRY, and also to several other utterances upon the same subject, it occurs to me that the writers have all left out of consideration a very important "factor," namely, the pressure exerted by the fall of the metal as it leaves the ladle. All molders know that if the iron is turned into a mold as fast as possible, right up to the moment the mold is filled, that the chances of a burst out or strain is greatly augmented, irrespective of the height of the gate or pouring basin, whereas, if the stream is slackened as soon as the head begins to come up, (that is, when the mold is filled,) there is less danger. To further show the importance of this matter, what molder has not seen a riser used, not to feed, but simply to take the strain off? I do not mean to say that this is the primary object of a riser, but it certainly is a first-class means to accomplish this end. It can only be accounted for from the fact that after the mold is full and the head just coming up, the metal will seek the point of least pressure, which in this case will be the riser, thereby relieving the pressure on the mold itself. Now on the principle that height alone causes pressure in molds, would not the sprue and riser together cause just twice the amount of strain that the sprue itself would, instead of relieving it?

The fact is that in studying the science of hydrostatics, which treats of fluids, and fluids alone, we forget that iron as soon as poured into a mold begins to solidify, especially at the gates, which being of less section than the casting, as a rule cools quickly, shutting off the pressure which would be caused by a head on a permanent fluid.

I do not mean to say that height does not cause pressure. It most certainly does, as long as the metal remains fluid, but what I do wish to impress, is that pressure is also caused to a great extent by the force or momentum used in pouring.

EDW. L. GROVER.

Some Anecdotes.

When great men have passed away anecdotes of their lives are related; and I will tell a few from the life of a great man who has not passed away, but who, by the strength of his muscle, has made enough money to start in the peddling business, and has departed from the molder's trade.

The first day he worked in the foundry he was put on the core bench, and at casting time he was taken into the foundry and instructed how to skim. The first ladle that he tried to skim was pouring a mold with a large core in it. Suddenly the foreman yelled: "Jack, light that smoke!" Jack dropped the redhot skimmer, felt in his pockets, and replied to the foreman: "I ain't got no match."

Jack was working on the core bench about two weeks, making round cores, when one afternoon an old tramp looked through the window and began asking Jack questions about the trade. Among other things he enquired of Jack why he put a hole through the middle of the core, to which Jack replied: "The reason I put the hole through the middle of the core is that when the molder puts the core in the mold he can look through the hole in the center and see if it touches the bottom of the print."

He had worked on the floor about a year when he was given a webbed gear of about 250 pounds weight to make. He had a reputation for rock bottom drags, and the first gear scabbed on the bottom, so did the second, when the old man gave Jack "hell" and told him to make the bottom softer. The next day it came bad and the old man told Jack to make it still softer and Jack replied: "If you want the drag of the mold softer you'll have to give the job to an upholsterer and not to a sand-pounder."

The laborer who took care of the tumbling barrels was laid up with a burnt foot, and accordingly Jack, who had a pull with the boss, got charge of the tumbling barrels. The first day his lungs and throat were full of dust and he was nearly choked. The second day he got a hose and turned water on the castings; of course they wouldn't tumble right, so the old man upbraided him, when Jack said: "What's the difference whether the castings tumble or not, as long as I ain't got no dust in here I am satisfied." W. E. T.

Basic Furnace Linings.

We take the following from a booklet issued by George G. Blackwell, Sons & Co., of Liverpool, England:

Magnesite bricks and calcined magnesite are now being very largely adopted by steel firms for lining their open-hearth furnaces, etc. The advantage of this material over dolomite is claimed to more than compensate for its excess in first cost. An analysis of the Blackwell magnesite bricks and calcined magnesite is given as follows:

	Per Cent.
Magnesia	91.50
Silica	0.35
Oxide of iron and alumina	6.05
Lime	2.10
	100.00

The high percentage of magnesia and the exceptionally low percentage of silica and iron indicated in these figures renders the bricks made from this material very refractory, accounting for the excellent results claimed to have been attained in practice.

Chrome ore of a most refractory nature—stated, indeed, to be the most refractory known—has for some time been produced by this firm for furnace linings and bottoms. Its exceedingly refractory nature makes it exceptionally useful as a separator between the magnesite and silica linings, and its economical claims are strongly supported by its continual use in most of the leading steel works. In Germany, and particularly in the United States of America, where very large quantities of basic steel are made, this ore is supplied in very large quantities. It is supplied also to practically the whole of the basic works in the United Kingdom. Some works use this ore in large lumps, filling in the interstice with ground chrome and tar. Others grind the ore roughly, mix it with tar, and ram it into the furnace for lining.

In conjunction with this ore chrome bricks are used, and also bauxite bricks, which latter are highly aluminous. They are guaranteed to withstand the highest temperatures, and to be perfectly hard and well burned. The chrome brick is of special use for separating the magnesia from the silica lining, for lining the tap-holes, and for use generally where the employment of chrome ore in lumps is not practicable. Bauxite bricks are neutral both to basic and oxide of iron, and for lining re-heating furnaces, where the oxide of iron of the iron scales quickly slags silica bricks, they are invaluable. They are also used with good effect for lining ladles.

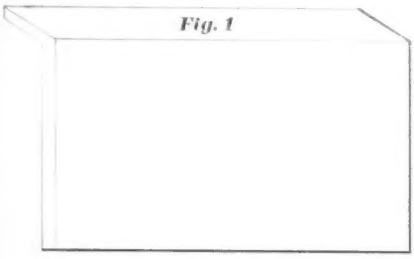
Not So Very Peculiar.

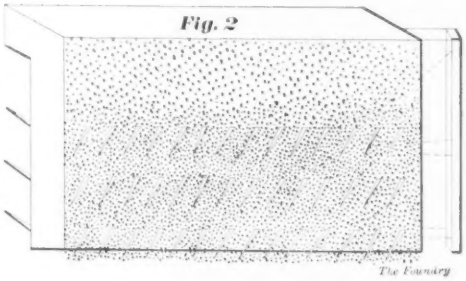
A peculiar accident occurred recently at the foundry of Williams, White & Co., Moline, Ill. After the ladle had been filled with molten metal and was being conveyed to the molding floor, it was noticed that a stream of metal was pouring from the bottom. This gradually grew in size until suddenly the entire heat was precipitated to the ground. The bottom of the ladle had burned out.—*Exchange.*

Fred H. Pike will shortly put into operation his new foundry and machine shop at East Randolph, N. Y.

An Example of Pressure in Molding.

There has been much written lately concerning the pressure of liquid metal and the laws governing same. There is an important fact, however, which produces strain, or evidence of strain, in thick, deep molds, which so far I have not noticed anyone mention. Let Fig. 1 and Fig. 2 represent two castings, one light and the other heavy, but both of the same shape and subject to the same hydrostatic pressure. The lower part of the flange in Fig. 2 will show much more strain than the lower part of the flange in Fig. 1. I have reference to green sand molding only. The molder who has not searched for the whys and wherefores jumps to the conclusion that a change in method of gating Fig. 2 will help matters. He begins to try various schemes of letting iron into the mold. He makes the gate larger or smaller, places it at the bottom or midway up, as shown in Fig. 2. He may even go so far as to give the mold a good deal harder ramming than he ever did before, but, for some unaccountable reason, the heavy casting will continue to show more strain than the light one, although, according to all laws, it is not subject to any greater pressure.





After exhausting his stock of experiments, the molder gets the idea deep into his mind that the bulk or thickness of a casting makes strain and pressure, and that neither head nor height, as it is called, has got anything to do with it and it is from such philosophy that the apprentice learns that the lighter the casting the less will be the lift on the cope, regardless of the height or head of lifting surface. At first thought, it does appear as if there is pretty good grounds for this opinion, but the fact that the damp sand contains 6 per cent and over of water when properly tempered and in a suitable condition for molding is not thought of at all.

The greater the area of a casting the longer it will continue in a liquid state and the more water it will evaporate from the sand, and when the sand is relieved of water, it of course is reduced in bulk or volume, and it tries to yield until coagulation is complete. To prevent the yielding of the mold walls, a good practice is to use well tempered sand as a facing, some 3 inches in thickness, and back this up with sand considerably drier. At the very bottom of the casting the sand can be bone dry if care is taken to have the well tempered sand thoroughly envelop the pattern. The dry sand will condense and absorb the steam generated in the facing sand and will have the tendency to increase the resistance to the strain of pressure of the iron, and prevent any yielding of the mold walls. If the mold is long, lay some spikes, gaggers, or rods horizontally, ends toward the pattern, and not over an inch away. Have these well settled and tucked with due firmness, and, as a further safeguard, always securely clamp down the cope before ramming it up.

At a nearby foundry some castings were made in green sand, with feet 28 inches by 8 inches and about 48 inches deep, of solid iron. In molding these castings, the method outlined above was followed, with the result that the strain on the mold, even at this depth, was insignificant. The shrinkage was very light compared to others previously cast.

Does the ordinary molder know what shrinkage is, or what the yielding of the mold is, or what the combination of the two mean? The greatest allowance usually made for shrinkage is 5-32 of an inch per foot, and as the bulk increases, this is modified to 1-10 of an inch for green and 1-16 of an inch for dry sand. Take any casting, no matter how chunky, and figure out how much of a hole there will be left in it, allowing ⅛ of an inch shrinkage to the foot. Then watch the molder when he feeds this casting and note how much iron he will pump into it. This can't all be for shrinkage. The water is driven out

and the mold is enlarging and the molder is helping it do this all he possibly can by filling the churning sprue clear to the top at the start, instead of being satisfied with giving it a head of three or four inches. If he would do so, there would then be room for the addition of hot iron when the edges become chilled, and, in this way, feeding could be kept up longer. There should not be such a great pressure put on a casting while it is in a very liquid state. L. C. JEWETT.

Among the Foundries.

John C. Lindsay resigned the superintendency of the Rossmore Co.'s Works at Peekskill, N. Y., a short time ago, and is embarking in the foundry business on his own account at Burlington, N. J., where he will conduct a general jobbing foundry. He expects to be ready for business by Nov. 1.

Ridley, Smith & Munson have entered the foundry business at Norwich, N. Y.

The Standard Steel Works of Philadelphia are having plans prepared for the erection of a new open-hearth steel furnace at their plant at Burnham, Pa., with a capacity of 135 tons per day.

The American Lawn Mower Co., Richmond, Ind., have outgrown their facilities in that city, and have lately purchased a large plant in Muncie, which they are now preparing for their occupancy. The company expect to be in operation there in the course of about 30 days, with much better facilities than heretofore.

Thomas Furlow & Sons, Philadelphia, Pa., are about to make additions to their brass foundry and machine shop. The capacity of the present plant will be doubled.

The Marysville Foundry Co., Marysville, Ohio, have started up their new foundry with ample facilities for the manufacture of all kinds of castings. The concern will make a specialty of land rollers and farm trucks.

The Franklin Steel Casting Co., Franklin, Pa., manufacturers of high grade steel castings, will extend their entire plant 160 feet, and will put in an additional 20-ton furnace. The construction is under the supervision of S. Diescher & Sons, engineers, Pittsburgh, Pa.

The Eaton, Cole & Burnham Co. of Bridgeport, Conn., manufacturers of brass and iron goods for steam, water and gas, have purchased on South avenue extension a large tract of land with dock property, and will erect at once a steel and brick foundry building 400 feet long and 150 feet wide. Contracts for the entire work have been let to the Berlin Construction Co. of Berlin, Conn.

The Wellman-Seaver Engineering Co. of Cleveland are preparing plans for the plant of the Acme Foundry Co., which will be erected in that city. The company have purchased a site, 450 x 200 feet, and will erect a foundry costing about $75,000. Their present plant will be abandoned.

The Racine Malleable & Wrought Iron Co. of Racine, Wis., has increased its capital stock from $25,000 to $200,000. A new foundry 500 x 75 feet will be erected.

The Walker Engineering Co. of Youngstown, O., has been granted a charter with a capital stock of $50,000. George E. Rose, J. W. Rogers, C. L. Walker, M. A. Norris and J. W. Long are the incorporators. The new company will do a general foundry, machine and forging business. C. W. Walker, the promoter of the company, now has a large machine shop at Youngstown, O., but the new company will probably dismantle this plant and locate on a larger site.

The Niagara Machine & Tool Works of Buffalo, N. Y., has been incorporated with $200,000 capital to engage in the manufacture of tools and machinery. Julius W. Georger, A. E. Heinz, C. M. Hughson, F. C. Bautz, O. J. Bautz, George A. Bautz and G. R. Munschauer are the incorporators.

The firm of Moffett & Banholzer, Birmingham, Ala., started in business about the middle of August. Both gentlemen had been with the Birmingham Foundry & Machine Works for some seven years; Mr. Moffett had been foreman of the pattern shop, but was later in the drafting room, while Mr. Banholzer was foreman of the foundry. They will confine themselves strictly to foundry work.

The Hartford Foundry Co., Hartford, Conn., has plans prepared for a new foundry.

The Bentel & Margedant Co., Hamilton, O., will erect a new foundry in connection with their present plant. It will be 102 feet long and 48 feet wide.

Robert J. McIntyre of Oxford, N. J., is building a foundry 46 x 105 feet in size at Allentown, Pa.

Baker & Shevlin Foundry Co., Saratoga, N. Y., will make large additions to their foundry and machine shop. Five new buildings are to be erected.

The Mahoning Foundry & Machine Co., Youngstown, has let contracts and broken

ground for their new plant. The contract for the buildings, steel frame with brick and stone construction, has been awarded to the Penn Bridge Co. of Beaver Falls. The main building will be 240 x 132 feet.

The Chattanooga Plow Co. at Chattanooga, Tenn., will erect a one-story addition to cost $1,500, to its foundry.

The Chicago Malleable Castings Co., West Pullman, Ill., has recently installed in its foundry a 10-ton melting furnace, and it purposes, with its increased capacity, to branch out after new business. The company make a specialty of railroad, agricultural and malleable castings. It recently added a gray iron department, and will henceforth make a specialty also of gray iron castings.

The Wulbern Machine & Foundry Co., Birmingham, Ala., has erected a 120 x 50-foot building, and expects to be in full operation at an early day. The president is Allen W. Krebs; vice-president, J. Wulbern; secretary, Louis G. Wulbern.

The United States Aluminum Co. of Pittsburg has been organized with $25,000 capital by the directors of the Pittsburg Reduction Co., for the purpose of erecting a plant to make finished articles from aluminum. The plant will be located at New Kensington, where the company's present works are located.

The Standard Signal Co., Troy, N. Y., has purchased a 12-acre tract in North Albany and let the contract for the construction of a new foundry, 360 x 60 feet. It is their intention during the coming year to erect upon the new site additional separate buildings for use as a power house, forge shop, machine shop, carpenter shop, storehouse and office. These buildings will be of fire proof construction and equipped with tools and machinery of latest design.

Jules Waas, New Haven, Conn., general iron work for buildings, has purchased a tract of land, 125 x 150 feet, in the rear of his plant, upon which it is his intention to build a foundry in the near future.

The Fort Pitt Malleable & Gray Iron Co. of Pittsburg have made application for a charter. No site has been selected for the new works, but it will be located in the Pittsburg district. The new company will operate an iron and steel foundry for the manufacture of malleable and gray iron castings. The incorporators will be John C. Reilly, James D. Callery, F. J. Lanahan, John Murphy and Joseph A. Weldon.

The Frank Ellis Gin & Machine Co., Memphis, Tenn., were organized September last and bought out the Globe Iron Works. They manufacture the same lines as the old firm, consisting of engines, boilers, saw mills and plantation and gin house machinery.

William A. Cather, proprietor of the Bluefield Iron Works, Bluefield, W. Va., has purchased the Franklin Iron Works, Port Carbon, Pa., and will take possession at once. He will make a specialty of air compressors, rope haulage plants, hoisting engines and drums, mining machinery and pumps.

The Bessemer Gas Engine Co., Grove City, Pa., manufacturers of gas engines, are erecting a new foundry, 90 x 100 feet, at their works, which will be equipped with the most modern foundry appliances. J. M. Albin, who has been in the foundry business in Mercer for many years, will have charge of the foundry.

The Uniontown Acme Radiator Co., Uniontown, Pa., will receive bids for the construction of a foundry building, 200 x 120; machine shop, 200 x 50; cupola house, 25 x 38, and sandshed, 25 x 152, to be of brick and steel. Andrew P. Cooper is the architect, and L. G. McCrum, secretary.

The foundry of the Ames Iron Works, Oswego, N. Y., will be greatly increased in size by the erection of an addition recently decided upon. When completed the foundry will be 300 feet long and 100 feet wide.

The West Penn Foundry & Machine Co., Avonmore, Pa., is erecting a 75 x 100 feet addition to its machine shop.

The National Malleable Casting Co., Sharon, Pa., will erect an addition to its foundry 725 feet long and 350 feet wide. The American Bridge Co. has been awarded the contract for the building.

The Hilton Brass Works of Brooklyn, N. Y., has been incorporated with $20,000 capital. John Hilton, J. A. Hilton, I. S. Hilton, H. C. Brooks and Jacob Rung are the incorporators.

The Carbondale Foundry & Machine Co., Carbondale, Ill., who were organized June 1, this year, do a general repairing business and carry supplies for the coal mines in the district. They have put up a building, main part of which is 24 x 60 feet, with an L 24 x 30 feet. They are about to erect a molding room 24 x 56 feet.

The March-Brownbach Stove Co. of Pottstown, Pa., will enlarge its foundry.

Morris & Lewis, proprietors of the Rock

Island Iron Works, Rock Island, Ill., have purchased the patents covering the Walch railroad brake shoe, and will shortly install a plant at their foundry for the manufacture of these brake shoes.

It is announced that the Gadsden Pipe & Foundry Company will begin construction of their new plant at Gadsden, Ala., at once.

The Vulcan Foundry Co., Hamilton, O., has been incorporated with $50,000 capital. W. N. Andrews, O. V. Parrish, W. E. Brown, R. R. Andrews and F. H. Flum are the incorporators.

The Hastings Iron Works, Hastings, Mich., will be reorganized with $40,000 capital and the plant will be removed to Battle Creek, Mich.

The Citizens' Foundry & Mfg. Co. of Salt Lake City, Utah, has been incorporated with $250,000 capital. The company will manufacture patented machinery for quartz and grist mills. M. A. Peters has been elected president; C. P. Miller, vice-president; R. C. Barnes, treasurer; J. P. Wilson, secretary.

The American Foundry Co. of Buffalo, N. Y., has been incorporated with $5,000 capital. H. C. Caldwell, F. Armstrong and M. F. Brown are the incorporators.

The Sterling Iron Works of Springfield, Mo., has received a charter of incorporation on the application of H. C. Mosher, H. T. Hornsby, R. P. Bowyer and others; capital, $50,000.

The Camden Anchor-Rockland Machine Co., Rockland, Me., manufacturers of anchors, marine and stationary kerosene and gasoline engines, have completed their iron and brass foundry. The building is 100 x 40 feet and thoroughly equipped for the handling of heavy and light castings.

The George H. Smith Steel Casting Co. of Milwaukee, Wis., has been incorporated with a capital of $50,000, to conduct a foundry for the manufacture of steel castings. It succeeds the Milwaukee Steel Casting Co. of that city.

The Hooven, Owens & Rentschler Co., Hamilton, O., has recently acquired a large tract of land adjoining its present plant for the purpose of making large additions. A new foundry will be erected 80 x 400 feet. The present foundry will be used for machine shop extensions. The cost of improvements and additions will be about $300,000.

The Lackawanna Iron & Steel Co., which is building a very large plant at Stony Point, near Buffalo, N. Y., is rushing work on its foundry and machine shop, so that it may commence the manufacture of the large amount of special machinery needed.

Fred Bauch, Alliance, Ohio, is building a 50 x 60-foot addition to his foundry.

Crozier & Hartley have entered the foundry business at Muncie, Ind. Their plant is known as the Eagle Foundry.

The Iron City Sanitary Mfg. Co. are building a foundry, 90 x 150 feet, at Zelienople, Pa.

The Loetzer Valve & Mfg. Co. has taken possession of the Frost machine shop and foundry at Towanda, Pa., having leased the same.

The Fort Madison (Iowa) Iron Works has been purchased by the Griffin Wheel Co.

G. E. Hayes has sold his interest in the Union Brass Foundry at Seattle, Wash., to his partners, J. W. Kremer and H. P. Hansen.

W. Eicher has leased the Paul foundry at Meyersdale, Pa.

The Chattanooga Plow Co. is building an addition to its foundry.

Patrick Brennan is building a new foundry at Creston, Iowa, 50 x 90 feet in size.

The Hodge Mfg. Co. of Greenville, Pa., is enlarging its foundry.

Plans have been drawn for extensive additions to the plant of the Colvin Foundry Co. at Providence, R. I.

The Northwest Thresher Co., Stillwater, Minn., is building a new foundry.

The Racine Boat Mfg. Co. of Racine, Wis., is reported as intending to add a foundry department to its works.

The Hanover (Pa.) Foundry & Machine Co. has leased the Glenville foundry for two years. It will be run in connection with their plant in Hanover. At least forty men are to be employed. Possession will be taken at once.

Work on the shop buildings of the Altoona (Pa.) Foundry & Machine Co. is progressing rapidly. The buildings altogether will cover 100 x 170 feet, and will consist of a molding room, 50 x 130 feet; machine and pattern shop, 40 x 50 feet, besides annealing department and the power plant. Swindell Bros. of Pittsburg have been awarded the contract for furnishing and placing in position two gas producers, one open-hearth furnace and four annealing ovens, with all necessary attachments. The contract price is $10,290.

The Sheridan Stove Co. of Quincy, Ill., has increased its capital stock from $40,000 to

$80,000. It intends to build an addition to its foundry early next spring.

The Brighton Foundry Co. of Chicago has been incorporated to do a general foundry business by P. Summers, O. Westberg and E. Magull.

The Niagara Hydraulic Engine Co., is making preparations to build a foundry and machine shop at Chester, Pa.

E. A. Stege will erect a brass foundry at Louisville, Ky.

The Brass Foundry & Heating Co. of Peoria, Ill., has increased its capital stock to $15,000.

The Appleton (Wis.) Screen Plate Works, whose plant was badly damaged by fire a couple of weeks ago, has arranged for the building of a complete new establishment on a very much larger scale in another location. There will be a machine shop, brass foundry, boiler house and office, all in separate buildings.

The Eclipse Gas Stove Co. of Rockford, Ill., has purchased the plant of the American Foundry Co. in that city. It is expected that C. H. Hopke, manager of the latter plant, will build a general jobbing foundry.

The Millett Core Oven Co., Brightwood, Mass., calls attention to the fact that there is being offered to the foundry trade an oven with swinging shelves and self-closing back doors, which it is advised is an infringement on the Millett patent core oven, owned and manufactured by the Millett Core Oven Co. The latter gives notice to the trade that it will protect its rights in the matter.

The Jacobson Machine Mfg. Co. of Warren, Pa., intends to double the capacity of its foundry.

Fairbanks, Morse & Co. of Beloit, Wis., will extend their foundry and machine shop and erect a large warehouse.

The Powers Foundry Co. of Elkton, Md., is building a new shop 150 x 40 feet, which will be furnished with the latest equipment for handling heavy work.

The American Grass Twine Co. of St. Paul, Minn., has assumed control of the extensive malleable iron works that have been operated heretofore by the Minnesota Malleable Iron Co. at Hazel Park. When the grass twine company purchased, in May, 1900, the plant of the Walter A. Wood Harvester Co., the malleable iron works connected with the harvester plant was included in the purchase. But that department of the plant was then operated under a lease by the Minnesota Malleable Iron Co., an offshoot of the Gillette-Herzog Mfg. Co. of Minneapolis. The lease recently expired and the malleable iron works reverted to their owners. The works are not merely complete and of large size, but they constitute the only factory of malleable iron in the Northwest. Hence the grass twine company will make the castings required by its own business and also those demanded by the railway companies and the jobbing houses.

M. R. Zahniser contemplates the erection of a new foundry, 60 x 80 feet in size, at Washington, Pa.

The Lees Foundry & Machine Co. are removing their plant from Cannelton, Ind., to Owensboro, Ky.

The Phoenix Foundry Co. has been incorporated at Detroit, Mich., with a capital of $25,000, to manufacture and sell all kinds of iron and other metal products. The organizers are Maximillian Wendland, John F. Shaening, George N. Reimold, William H. Flynn, Frank Zannotby and William H. Flynn, trustees.

The El Paso (Texas) Foundry & Machine Co. has increased its capital stock to $100,000.

The Hanks Foundry & Stove Works has been incorporated at Rome, Ga., with capital stock of $12,000, for the manufacture of all kinds of stoves, by J. D. Hanks, W. W. Smith and M. Z. Whitehead.

The Flynn & Emrich Co. have been incorporated at Baltimore, Md., with a capital of $80,000, by James Flynn, James E. Flynn, William A. Riordan, Sophia M. Emrich and Kate A. Flynn, to deal in all kinds of machinery and steam and hot water heating apparatus.

The Keystone Foundry Co. has broken ground for its new plant at Keystone, W. Va.

The Jordan Foundry & Machine Co. at Oklahoma City, Okla., are rapidly rebuilding their plant, burned a short time ago. It will represent an outlay of $15,000 when finished.

Considerable activity is noticed in the foundry trade of British Columbia. At Vancouver the Albion Iron Works of Victoria has taken over the plant of Pollock & Dickinson and will modernize it throughout. Ross & Howard of the Vancouver City Iron Works are building a new foundry and machine shop and will pay especial attention to marine work. In addition the Vancouver Engineering Works are installing a foundry plant for their own use.

Jules Mauget, lately with the W. W. White-

head Co. of Davenport, Iowa, and Otto Corken, formerly superintendent of the Rock Island (Ill.) Novelty Co.'s plant, have purchased the Maquoketa, Iowa, foundry.

The Insurance Stove & Range Co. of Covington, Ky., which began business a short time ago, were badly crippled by a recent fire, but are again in operation.

The Acme Foundry Co. of Cleveland, Ohio, has purchased a new site on which a modern foundry will be erected.

The Pittsburg Stove & Range Co. has signed a contract with the Board of Trade of Beaver Falls, Pa., by which all the foundries of the Pittsburg Stove & Range Co. will be removed to Beaver Falls. The concern has acquired a site of 23 acres and plans are now being drawn for the large new foundries which are to be built. At the present time the Pittsburg Stove & Range Co. are operating five stove foundries. Three of these, the Anschutz-Bradberry, De Haven and Bissell works are at Allegheny, the Graff works at Monongahela City, and the Baldwin and Graham works at New Castle. All these five plants will be consolidated at Beaver Falls.

Deaths.

Henry W. Cramp, eldest son of Charles H. Cramp, and vice-president of the William Cramp & Sons' Ship & Engine Building Co. of Philadelphia died October 3 at the Devon Inn, Devon, Pa. He was born in Philadelphia in 1851, and in 1870 he entered the machine shops of the I. P. Morris Co. as an apprentice, but owing to ill health was obliged to abandon that pursuit after a year, and on the advice of physicians went to sea for two years for the benefit of his health. In 1886 he was elected secretary of the Cramp Co., to succeed his uncle, Theodore Cramp, who had previously held that position since the company was incorporated. On the reorganization of the company, May 1, 1891, he was made a director. Mr. Cramp then served continuously as secretary of the Cramp Co. until June 6, 1895, when he was elected vice-president and treasurer, which position he held at the time of his death.

George Plitt, aged 69 years, senior member of the firm of George Plitt & Sons, iron founders of Baltimore, Md., died on September 27 after a long illness. Mr. Plitt was a native of Germany and came to America when a boy. In 1873 he started in the foundry business in Baltimore, where he became a prominent business man, being actively connected with a number of financial and philanthropic institutions.

Thomas Flower, formerly a member of the old established brass and iron foundry firm of James Flower & Brother, Detroit, Mich., died September 29, at his home in that city, aged 78 years. He was born in Manchester, England, and came to this country in 1847, settling in Detroit.

George Willis Walker, president of the Walker & Pratt Mfg. Co., Boston, died Oct. 4 at his residence in Malden, Mass. He was born in 1827 at Exeter, Me., and went to Boston in 1845. Mr. Walker had been the president and executive head of the Walker & Pratt Mfg. Co. since its organization in 1874 and had brought out many improvements in connection with stoves, furnaces and heaters.

Insuring Patterns.*

No single item is more in disfavor with the insurance companies than that of foundry patterns.

The value of the active pattern is the cost at which it could be replaced in the open market. It is a peculiar fact that the patterns representing the very essence of a foundryman's business is a less tangible asset than the scrap iron heap. There is no foundry asset so susceptible of fluctuation and difficult of valuation, and at the time of loss, so liable to suffer from the adjuster's depreciation charges, etc., as that of patterns. This is largely due to the fact that in case of fire the damage to patterns, as a rule, results in total loss. If not actually destroyed they are made valueless through the heat or water and generally a partially damaged pattern will cost as much to be repaired as a new one. In addition to this there is a difficulty in adjusting values. The bone of contention is the question of depreciation. A pattern which has cost many hundred dollars may be obsolete, or after having been used once may never be brought into service again, and is of no value, the cost of its production having been charged to the cost of making the casting. Other patterns may have been in use for a long time and subject to heavy depreciation charges. The pattern which may have been worth the cost of production last month may suddenly become obsolete and valueless.

*From a paper prepared by Frederick Conlin, manager of the Bethlehem Foundry & Machine Co., Bethlehem, Pa., for the Buffalo meeting of the American Foundrymen's Association.

This rapid fluctuation between a useful tool and a piece of scrap wood illustrates the difficulty of adjusting losses. The element of cost being almost entirely that of labor, which is absolutely lost when the pattern is "scrapped."

An important law decision defines patterns as tools. The plaintiffs were manufacturers of machinery and kept wooden patterns to make the iron castings needed for the machines. The policy insured their fixtures, movable machinery, engines, lathes and tools, and it was held that the parties intended to include patterns in the word tools and that the policy covered all patterns which from their size and shape admitted of being applied and managed by the hand of one man. The underwriters were no doubt influenced by this decision as they at present stipulate that if patterns are included in a general policy, they must be specified in a separate item, and a fixed amount stated as the limit of the risk assured on them. It is further required that the figure given must not exceed ten per cent of the amount of the policy. Under certain favorable hazards the limit is sometimes increased to twenty per cent. This is, however, exceptional.

An insurance official in discussing the question of patterns, expressed the following opinion: "The temptation to show a high value upon obsolete patterns is too great for some men and as a result insurance companies are frequently asked to pay high prices for patterns after a fire which were considered of trifling value before the loss. This is not a reflection against foundrymen generally. We base our estimates upon say 1,000 losses, and it takes but a very few individual fires where excessive claims are made to raise the average loss to a figure much above what we consider normal. This brings in the question of moral hazard which insurance companies are obliged to consider in connection with the risks which they assume. Again, as a rule, pattern shops which are extra hazardous are generally in close proximity to places where patterns are stored. This adds considerably to the risk. Patterns should be stored apart from the pattern shop and if possible kept in detached buildings.

Another high authority gave the following views: "In considering insurance risks the rates are based upon the average loss of say one thousand fires. The average appraisal of loss runs less than 50 per cent of the amount of insurance. If the underwriters should figure upon the basis of a total loss the present rates would be much higher. The trouble with a pattern, from an insurance company's standpoint, is that there is rarely any salvage. Hence when we have a loss with patterns, it is a heavy one and way beyond all proportion to the percentage of loss on the balance of the other classes of property unsaved. In other words there is no salvage to a pattern loss while with ordinary merchandise, it is sometimes surprising how much we recover from goods which have been in a litter covered with rubbish and ashes or soaked with water."

"In practice where the assured is inclined to be fair and meets us halfway, it is rare for us to have a serious dispute as to these matters, we generally get together and settle the question without much loss of time."

Another official of a prominent insurance company gave the following definition of obsolete patterns:

"An obsolete pattern is one not liable to be used, and if the foundryman cannot show by his books that a pattern has been used in say five years' time, we consider it obsolete. The fact that a foundryman has put such pattern away and given it store room has no bearing upon its value. We store from time to time numerous papers and documents which we never expect to be obliged to refer to, and yet we give them house room having in mind the faint possibility that we may want to refer to them. The fact that we store these papers away does not make them valuable. I do not consider a pattern obsolete if you can take me a casting made from it and show me that such casting is in use. All active patterns and also patterns for castings in general use, articles of commerce, recognized as staple merchandise, in fact for any casting which would have a market value as a manufactured article, should be classed equal to new or cost of reproduction."

The insurance companies have striven to influence legislation so that the assured assumes the responsibility of fixing the amount of policy which has no bearing on the amount of payable loss. It is not until the loss occurs that the insurance company takes up the question of valuation.

The underwriters claim that it would not pay the insurance company to fix the values on patterns or any other class of property as this would entail the employment of an expert at say $25.00 per day to go and make such valuation. This expense would be more than equal to the insurance premiums received. Besides, the value of the patterns at the time of insuring would not be identical with their value at the

time of the fire. The insurance company will not accept without question the foundryman's valuation and in case of loss, if the amount warrants the expense, the opinion of an expert is obtained to determine if the claim for loss is excessive.

Insurance policies usually include a clause which stipulates that in case of loss, if the insurer and assured fail to agree upon an adjustment, the matters in dispute shall be submitted to arbitration and in case the parties voluntarily proceed to settle their disputes in this way, the court will enforce the award when so made. In case, however, the assured is not willing to arbitrate, any dispute becomes a question for the court to decide. The insurance companies as a rule taking their time in law suits, the adjustment of a claim this way is seriously delayed, and it is found perhaps more advantageous to effect an early settlement by arbitration. In such case the underwriters will, for their own credit, appoint a first-class man and the assured will of course make the best selection he can. By these means the final decision is usually a just and equitable one.

The records show that the insurance companies contest from 1 per cent to 2 per cent of losses incurred.

It is a peculiar condition that while insurance officials object very much to the "valued" policy in a general way, a number of them favor the adoption of its principles in the question of insuring patterns. As one worthy president of a prominent insurance company puts it: "We would much prefer to take the foundryman's idea of the value of patterns before the fire, rather than after it. His ideas are generally more conservative as to value at the time of taking out policy, having the premium to pay. If the insurer should have a schedule of his patterns made out, putting a value upon each pattern and attaching such schedule to the insurance policy, we would be more inclined to accept the valuation given in such schedule than under any other method of adjusting pattern claims."

In practice it is not advisable for the assured to issue a schedule of patterns and prices to be attached to policy, as there are so many changes liable to exist among the patterns, new ones taking the place of old ones, etc. The foundryman would not have the margin of "give and take" in adjusting such matters if each pattern insured was scheduled any more than if he should go by the exact schedule of his general inventory taken at the time of issue of policy. Such schedule would be radically changed, although the actual total value of property might not show much variation at the time of loss, in comparison with the amount of insurance agreed upon.

In case of casualty the insurance company is under contract to either reproduce the articles lost in as good a condition as they were before the fire or to refund in cash the cost of their reproduction. The value is based upon the market selling price at the time of loss. The law holds that if the property does not command a ready market, the price which it would bring at a present sale would not be considered a fair criterion of value, but the cost required to replace it, in its condition before the fire, would be considered the true value. Accordingly any pattern in active use and in fit condition for molding, producing a satisfactory casting, is as good as a new one and worth as much.

Probably the most systematic method of establishing the true value of patterns to be used as an inventory for figuring up the firm's assets, or to serve as a schedule giving a true record of patterns at the time of fire, is to keep a pattern book in which should be recorded the name and number of each pattern, its cost, or value, all entered in columns under classified headings of active, active worn, semi-active, emergency, and obsolete. Every pattern broken up or rendered worthless to be taken from such schedule, every new pattern added, to be entered. Patterns which might be safely considered as obsolete should be charged off. This classification is to be made upon some fixed basis.

The following may serve to suggest the general classification of the various patterns in regard to their durability and earning power. There should be no depreciation charged against an active pattern. To be useful it must be kept as good as new, as it is a most unprofitable policy to work with patterns in any other than the best possible condition. Patterns classed as active worn are those which are not sufficiently worn to be considered out of service.

The active worn pattern should be determined in accordance with the wear and probable extent of durability. The foundryman's judgment must be relied upon in classifying, but a 50 per cent depreciation should be charged off, in case the pattern should be considered sufficiently worn to warrant its transfer from the active list. In making up the valued schedule the premium to be paid on the

amount of risk will tend to make the classification come well within conservative lines.

The customer's patterns should be considered active.

If service is liable to be required at any time, the semi-active pattern is worth the cost of a new one, as its earning power would be the same as if new. It is, however, advisable to deduct a fair depreciation from a pattern of this class, say 15 per cent per annum, as with the rapid development, in all mechanical pursuits the patterns of today are liable to be obsolete in from five to ten years. If, however, the pattern is one which has been made for a certain part of machinery in service but only required for use in case of breakdowns, such pattern should be classed as "emergency" and be charged with depreciation according to its durability and earning power. To establish a fixed basis for valuation the rate charged off should be 25 per cent per annum.

If a pattern has been made to fill a customer's order for castings, notwithstanding the fact that this item of its cost has been considered in the charges for the casting, and provided the ownership of such pattern remains with the foundryman, it should be considered an asset, regardless of the conditions under which it was made, and if either active, semi-active or emergency, it should be entered and considered upon its classified basis of valuation without discrimination.

When the casting made from a pattern is not liable to be put to further service, or if the pattern is for a machine or a portion of one which has been thrown out of service, and abandoned, such pattern is useless and obsolete.

Obsolete patterns which could be applied to other uses than those for which they were originally intended should be considered as of little or no value, as they would require more or less altering before available and are "deadwood" until brought into active service again.

An active pattern may pass into semi-active, if the demand for its use falls off, and it may eventually become obsolete, if found of no further service, although its condition may be good. An annual survey would determine all this and lead to a revision of the schedule, but if in the interval a fire should occur the face value shown by this schedule should be accepted as shown.

These principles apply equally well for insurance regulation under either "Standard" or "Valued" forms of policy.

In regard to customer's patterns, unless there is a special clause in the policy whereby the insurance company agrees to cover and include in its risk "the patterns held by the assured, the property of others for which the assured may be responsible," the customer's claims will not be recognized by the insurance company. The insurance company insures the owner of the goods and not the goods, hence the question of ownership is of vital importance in the settlement of a loss. No one can insure that which he does not own or for which he is not responsible.

If a customer sends his patterns to a foundry to be used for making castings and there is no specific guarantee given by the foundry assuring responsibility for such patterns, the foundry does not become liable for the loss in case of fire. The insurance companies hold that you cannot make a contract for them and they do not agree to insure the customer's patterns unless there has been a special arrangement assuming the responsibility for such patterns, and the policy issued to the foundryman does not accordingly cover the property. The law holds that where the property is held for the benefit of both baylor and baylee, or in other words, customer and foundryman, it is reasonable to expect ordinary care from a man of ordinary prudence. If upon the request of the baylor or customer for his property, the foundryman states that he cannot make delivery of the property, as it was destroyed by fire, then to recover, it will be necessary to show that such fire was due to the foundryman's negligence. The burden of proof is on the customer to show that it was due to negligence on the part of the foundryman before the responsibility can be fixed. The various legal quicksands in the question of protecting the customer's patterns, make it advisable to have the customer insure his property in his own name, distinct and clear from the insurance policy taken out by the foundry. By the customer taking out a policy for the patterns in his own name, all questions as to the title of his property would be carefully defined and he would not run the risks of the foundry failing to come under the average clause. The customer can insure his patterns to their full value and the insurance companies would, under the circumstances, accept the risk without including insurance on other property, thereby in case of loss, the customer is in a much better position for readily adjusting his claims.

The customer's patterns when held by the foundryman are similar as a fire risk to the conditions under which the marine policy serves.

They are held by, and subject to, the control of others and the policy should have valued schedule attached, as all the patterns sent to a foundry for use must be considered "active" and of value equal to the cost of replacing.

The transfer of patterns via railroad or other common carriers need not involve the question of fire insurance, as it is a part of the duty of the common carrier to assume this risk for the owner. When the shipment is accepted in good order the transportation company agrees for a consideration to deliver the goods in like condition at stipulated point of delivery.

The insurance companies generally admit that in case of destruction of patterns by fire they have no fixed basis of adjustment of a loss nor method of charging off for depreciation. They proceed to make settlement upon the most equitable basis between the assured and themselves. It would be of great advantage if an established basis of valuation could be pre-determined by both parties. The foundryman insures according to his ideas of value, frequently the adjuster's deductions in case of loss cut a wide margin from the item in policy, covering patterns. The amount of premium which the foundryman has been paying based upon its valuation has been probably duplicated for many years.

An established system of valuation would have saved this excessive outlay. The insurance companies having received more premium than actually due them through such over-valuation. The opinions expressed by a number of influential insurance officials indicate that the underwriters would co-operate in formulating and adopting some fair and equitable basis for appraising the value of patterns. Such valuation to hold good in the adjustment of claims for loss.

Personal.

J. I. Lyle has been appointed manager of the New York office of the Buffalo Forge Co.

William Foxel, formerly with Stanley G. Flagg & Co. of Philadelphia, is now foreman of the foundry department of the Norway Iron & Steel Co., York, Pa.

W. A. Kenney has resigned the position he has held as foundry foreman with the Cameron Steam Pump Works of New York City.

Edward J. Etting, with offices at 39 Cortlandt St., New York, and Land Title, announces that he will hereafter represent the S. Obermayer Co. in that territory, which gives him a complete line of foundry supplies as well as equipment.

Very Picturesque.

Jack Smith, the jovial foreman of S. F. Hodge & Co.'s foundry at Detroit, Mich., allowed a reporter to enter the premises the other day, when a large marine cylinder was about to be cast. The following sentences from what the newsgatherer said the next day in his paper must have appealed to the Scotch humor remaining in Mr. Smith:

"The scene presented as the molten metal at a temperature of 2,000 degrees was poured from the ladles into the mold, was worthy of the brush of a Titian.

"Two great ladles filled with liquid, golden iron hung from big cranes by heavy chains, while men with the soot and grime of the foundry on their clothes and faces, swung and tilted them by means of long iron handles. Gradually the ladles, one containing six and the other ten tons of the molten iron, were tilted until the metal began pouring over into the mold, throwing a lurid glow over the stalwart men and the interior of the shop.

"Then as the iron found its way into the mold and came in contact with the sand, a gas was formed which escaped through little vent pipes. Workmen set fire to the gas as it began escaping, and as these little blue flames, burning all over the top of the mold, rose and fell, they added greatly to the picturesqueness of the scene. One of the workmen who came too near to one of the flames, had his trousers leg set on fire. He began beating it vigorously, but the flames gained headway until he had to jump from the top of the mold and rush for the tank of water. When he returned there was a hole in his trousers a foot square."

Fires.

The graphite refinery and foundry facing mill at West Bethlehem, Pa., and owned and operated by Pettinos Brothers of Bethlehem, was recently destroyed by fire. The mill was built in 1898 at a cost of $15,000.

The plant of the Columbus Malleable Iron Co., Columbus, Ohio, was completely destroyed by fire, entailing a loss of about $35,000, fully insured. The plant consisted of a main building and several smaller ones, built of corrugated iron. Their combined dimensions were about 150 x 100 feet. The buildings were only erected about a year ago.

The pattern shop and foundry of the McNamara-Koster Foundry Co., Indianapolis, Ind., was recently considerably damaged by fire.

The brass foundry of Charles Mousley & Co., Philadelphia, Pa., was destroyed by fire; loss, $7,000.

The foundry of F. N. Peter & Bro., Deibertsville, Pa., was recently damaged by fire to the extent of $5,000; insured.

The plant of the Duffy-Trowbridge Stove Mfg. Co. of Hannibal, Mo., was damaged by fire to the amount of $15,000.

A fire burned out the machine shop and brass foundry of Halstead & Co., No. 1129 Cherry street, Philadelphia; loss, $6,000.

The machine shop and foundry of Kenney & Co., Scottdale, Pa., was entirely destroyed by fire; loss is estimated at $75,000.

The Taunton Locomotive Works at Taunton, Mass., was damaged to the extent of $2,000 by a recent fire.

The Edwardsville (Ill.) Brass Co. had its plant damaged by a blaze starting in the casting room. The loss is estimated at $1,500.

The Joliet (Ill.) Stove Works had several departments destroyed by fire Oct. 4. The loss is especially heavy on patterns. Moore Bros., the owners, will rebuild immediately.

F. W. Reese's foundry at Paris, Ill., was visited by fire Sept. 28, a number of patterns being destroyed.

Fire in Gerst Bros. Mfg. Co.'s foundry at St. Louis, Mo., did a damage of about $4,500, fully covered by insurance.

A loss of $11,000 was caused by a recent fire at Chadwick Bros. brass foundry at Hamilton, Ont.

The Byram Foundry Co. of Indianapolis had its foundry badly damaged by a recent fire.

The foundry of W. H. King at Coshocton, Ohio, was destroyed by fire, together with a large number of patterns.

Making Sand Castings of Copper.

Copper when in the molten state absorbs, or develops, gases, which permeate its mass and are imprisoned therein as the metal solidifies, making it porous or spongy. Owing to this peculiarity, castings of pure copper cannot be made, no matter how carefully the metal may be melted and its surface in the crucible protected. It is always necessary to add some metal or metalloid that will combine with and remove these gases.

In 1823 Robert Mushet took out a patent in England for a process of improving the quality of copper and making it more suitable for the sheathing of ships, etc. He recommends the following proportions:

(1) 100 pounds copper, 2 ounces zinc.

(2) 100 pounds copper, 2 ounces zinc, 4 ounces antimony.

(3) 100 pounds copper, 8 ounces of arsenic.

(4) 100 pounds copper, ½ ounce zinc, ½ ounce tin.

(5) 100 pounds copper, 2 ounces arsenic, 1 ounce antimony.

(6) 100 pounds copper, 1 ounce zinc, 2 ounces antimony.

The alloying metals are added after the copper is melted, its surface being protected by a covering of charcoal or other material. Great care must be exercised in handling arsenic, not to inhale the fumes. It should be wrapped in blotting paper and pushed under the surface of the metal. When stirring liquid copper an iron bar should not be used, as iron is highly injurious. A good stirrer is made by sawing a strip, about 2 inches wide, from an old "seventy" or "eighty" crucible, then taking a piece of inch gas-pipe 6 feet in length, splitting one end for about 8 inches, spreading the split end to admit the piece of crucible and then wedging in place.

Another method of making copper castings solid, as invented by Walton, is as follows: Mix 8 pounds of either oxide or carbonate of zinc with 1 bushel of ground charcoal; wet, and make into a stiff paste, using molasses water, and portion it into rough balls of the size of an orange, and dry at a moderate heat. When the copper is just melted, drop in one or more of the balls, so that, when they drop in pieces, the surface of the metal will be entirely covered, thus excluding the atmosphere. The zinc in the mass is liberated and, according to the inventor, combines with any oxygen that may remain in the crucible. By this method only a very small proportion of zinc is alloyed with the copper.

Another method is, to add a quantity of cyanide of potassium shortly before removing the melted copper, which is well stirred before pouring into the molds. Cyanide of sodium and yellow prussiate of potash also may be used.

Gretchell recommends: To every 25 pounds of copper, heated to redness in a crucible, add 1½ pounds potash or soda, 1 pound alum, ¼ pound of bone dust and ¼ pound of zinc or tin; melt, remove slag, cover with charcoal and run into ingots. He claims that this makes the metal hard, dense and tough.

T. D. Bottome says: Cast copper is hardened and toughened by treating it, when in the molten state, with sodium or its vapor.

For small quantities, under 10 pounds, a graphite crucible with an asbestos cover is used, and about one-tenth per cent of pure sodium is introduced into a cavity in a carbon rod and stirred into the metal, which is covered by a layer of common salt. For larger quantities a mixture of bicarbonate of soda and anthracite coal is placed above and below the copper in the crucible, and the sodium vapor is produced by the reduction of the sodium salts. If the castings are too soft, they should be quickly reheated and allowed to cool in hot graphite dust. He purifies impure copper by stirring into it a mixture of 3 parts nitre and 2 parts argol. Phosphorus also is used to prevent porosity in copper. A reliable mixture for hammers, soldering bits, etc., is: Copper, 100 pounds; zinc, 1½ pounds; stick phosphorus, 1½ inches. Silicon copper also is recommended in the proportion of 1½ to 2 pounds to the hundred of copper.

In summing up the effect of these various alloys on copper we find that, according to Ledebur, tin alloys with copper and diminishes its extensibility, a marked diminution being only produced when the proportion of tin reaches one per cent. Zinc alloyed with copper diminishes its malleability when hot. A zinc copper alloy, containing over 20 per cent of zinc, is less malleable than copper at all temperatures.

Dr. Carl Schnabel says: Lead can be melted with copper in all proportions, but the greater part can be liquidated out by a gentle heat; 0.15 per cent of lead does not affect the malleability of copper in any way; with 0.3 per cent of lead it becomes slightly red short; with 0.4 per cent, slightly cold short. Arsenic in small quantities has no injurious effect. Hampe found that 0.5 per cent produces no bad effect. Only when the arsenic reached 1 per cent could a slight degree of red shortness, but no cold shortness, be noticed. Copper with 0.8 per cent of arsenic could be drawn into the finest wire. Antimony up to 1 per cent does not affect copper; over 1 per cent it makes it extremely red short. Taking Hampe again as our authority, we find that "silicon hardens copper without impairing its toughness or malleability, when less than 3 per cent is present; 6 per cent makes it brittle, and with 8 per cent it can be pulverized." In cases where a high electric conductivity is not especially desired, the copper, zinc, phosphorus and silicon alloys can be relied upon to make good, sound castings. In castings for electrical machines, such as commutator bars, etc., it is highly important that the conductivity shall be retained as near to that of pure copper as possible, and the metal that is highest in this respect will be most in demand for such purposes. Antimony, phosphorus, silicon, arsenic and aluminum all diminish the electric conductivity of copper. The conductivity of aluminum is only 59, that of pure copper being taken as 100. Many experiments have been made in order to obtain solid copper castings having a high electric efficiency, and consequently various secret processes are in use. One of these is: Take of Cowles silicon, aluminum and copper alloy (pulverized) and oxide manganese equal quantities; mix. To 2 ounces of this add an equal quantity of a flux, composed of borax and nitre, equal parts; tie up in paper and mix with 100 pounds of copper five minutes before pouring. A high degree of electric conductivity is claimed for this metal; it is slightly cold short. Its chief drawback seems to be the difficulty of obtaining clean heavy castings. Thin, light castings are as clean and smooth as can be desired. The heavier work, however, is very difficult to "get," no matter how gated. In the opinion of the writer, the use of aluminum in copper is undesirable for several reasons; one of which is the difficulty of using up the gates and scrap in brass and bronze, owing to the whitish discoloration characteristic of aluminum, which gives the customer the impression that poor scrap was used in making the castings.—*C. Vickers, in American Machinist.*

Concrete Steel Foundry Floors.

The Eastwood company's machine shop and foundry in Paterson, N. J., was built and equipped for the manufacture of silk and general machinery. The foundry building is one story in height with brick walls and a steel framework, and has an 88 x 100-foot main part and a 22 x 100-foot wing. It is located near the center of the city where land is valuable, and the excavation of a basement story under almost the whole of the building was equivalent to providing a good-sized yard. It furnishes abundant storage for sand, coal, iron, etc., and for piling flasks and other bulky articles where they will be conveniently accessible for use in the foundry. This construction involved the building of a very heavy solid floor at street level, and it was made of flat concrete slabs supported on concrete beams and girders, all of which were reinforced with twisted steel ten-

sion bars imbedded in the lower part of the concrete according to the Ransome system.

The floor is proportioned for a load of 250 pounds per square foot and is made in panels 5½ feet wide and 22 feet long on centers. The Portland cement concrete is mixed 2:3:5, the aggregate being ½-inch screened stone. It has ¼-inch reinforcement rods 6 inches apart, and is 4 inches thick, with ¾-inch top coat made 1 part cement and 2 parts of sand, with 50 per cent beach gravel up to ½-inch in size, and is troweled smooth. The floor slabs are carried by floorbeams 5½ feet apart and 22 feet long, which are in turn carried by girders supported by columns 11 feet apart in rows 22 feet apart. Both floorbeams and girders were made monolithic with the floor slabs, and the latter were separated without open cracks, to make expansion joints over every girder and every alternate floorbeam, thus dividing the floor into 22 x 11-foot panels, each of which was made in one continuous operation.

The floorbeams were all made in single solid sections, those under expansion joints having one upper corner rebated to receive the edge of the adjacent slab, which was usually built on the finished surface without any separation, and was not divided from the beam except by the lack of adhesion between smooth concrete surfaces made at different times. Each girder was, however, made in two nearly equal parts separated by a vertical joint with an offset corresponding to a tongue and groove. The twisted rods in the floor slabs were laid to project across the rebate in the tops of the expansion beams and lap past those in the adjacent slabs so as to lock them together. Similarly the twisted rods in the floorbeams were made to project a few inches beyond the end so as to extend across to the opposite face of the double girder and lock its halves together.

Different spacing was required for the floorbeams in the wing and in the main building, and no difficulty was found in staggering them so that they were discontinuous across the main girder. The columns which support only the foundry floor are made of cast iron and receive the bottoms of the concrete girders on their horizontal cap plates; those which support the roof and framework are made of riveted steel sections and are continuous through the concrete floor, receiving its beams and girders on horizontal shelves with reinforced brackets about 8 inches wide similar to those for steel I-beams and girders.

At the street front the concrete floorbeams are supported on the steel I-beams which are framed into the columns, and as the available bearing on one side of the bottom flange was not considered sufficient, additional support was given to the concrete beam by building into it an ordinary U-shaped stirrup of flat iron, hung from the top flange of the I-beam as if for a wooden beam. Both floorbeams and girds are made 1 inch wider at the top than at the bottom so as to draw easily from the molds, and all concrete for them and for the floor slabs was rammed in molds of ⅞-inch matched boards tacked together and supported on blocks set on vertical posts and cross beams in such a manner that they could easily be knocked out and fall down when the concrete was sufficiently set.

No pains have been taken to limit or distribute the load coming on this floor from the ordinary heavy work carried on in the foundry. Core ovens are built on it, and heavy castings are molded and poured at any convenient point. Twenty-ton loads have been carried over it on the sharp flanges of a four-wheel truck with a wheel base about 2x6 feet, without causing any perceptible deflection or injury, and no cracks or chippings have been observed from impact. The jack shafts for an electric motor and a blower are suspended from the floor by bolts in holes drilled through the concrete, and the bearings are firm and solid and there is no sign of difficulty from vibrations.

The basement is continued under the sidewalk and the vault is roofed with Ransome concrete pavement slabs 1⅞ inches thick, supported on the lower flanges of the steel I-beams. Sharpe's patent glass lights are set in the concrete 3 inches apart on centers, and give a satisfactory illumination below. The glasses are slightly conical with three ribs to engage the concrete and have a rounded rim projecting below the under surface of the concrete, which is claimed to be effective in reflecting the light and diffusing it more satisfactorily than is done by ordinary lenses.

The above is from the Engineering Record, which says that Joseph Sharpe of Paterson, N. J., is the designer and builder of this interesting foundry floor.

The Eastern Foundry & Mfg. Co. of Pittsburg have bought three acres of land in that city, on which is a large building and which will be used by the company for a foundry. W. E. Hartman of McKeesport is president of the concern.